ENGINEERING AND MINING JOURNAL

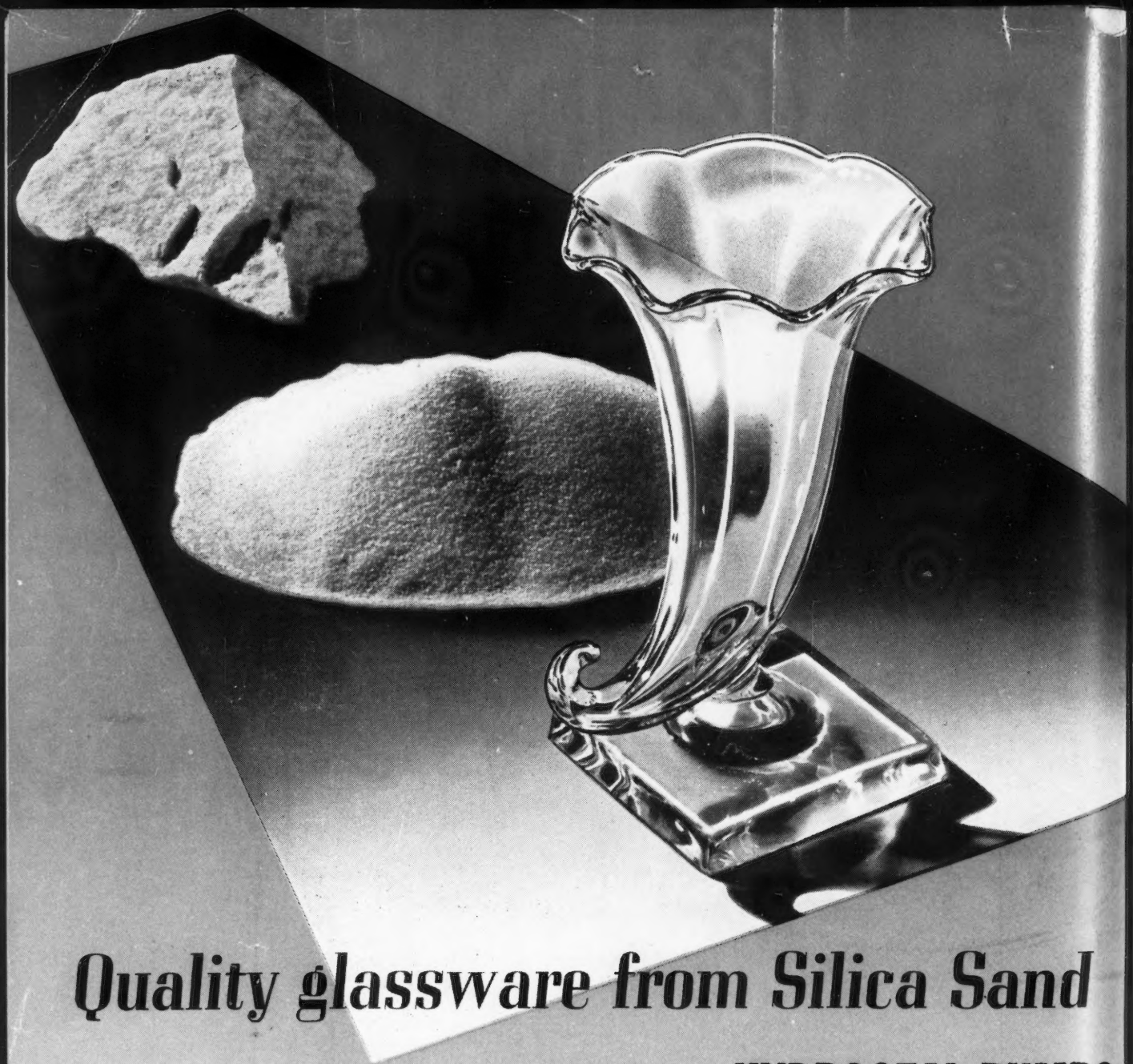
JAN 9 1945

December, 1944

Iron Ore Sink-and-Float Pioneer—Butler Brothers' Harrison Plant

Cananea's New Porphyry Copper

SEE PAGE 74



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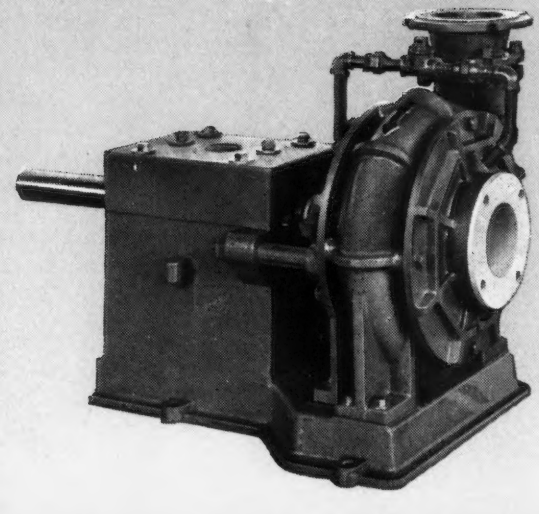

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VOLUME 145 — **DECEMBER, 1944** — NUMBER 12

Editorials 71

How Cananea Develops Newest Porphyry Copper ..... ROBERT H. RAMSEY 74

Rubber-Tired "Blitz Buggies" Haul Ore Underground ..... S. S. CLARKE 88

Let's Look at Mercury ..... W. M. STIEH 91

Fast Work in Retimbering Burned-Out Shaft 92

Bureau Seeks Strontium from Domestic Ores ..... M. M. FINE and R. G. O'MEARA 93

Flin Flon Shatter Cut Speeds Up Drifting ..... HAROLD KRAMER 96

Power-Driven Auger Drill Cuts Exploration Costs ..... LEON W. DUPUY 98

Solving a Tailings Re-treatment Problem—III ..... ALBERT SILVER 100

Operating Ideas 103

Gun Harnesses Explosive Power to Split Lagging * Simple Rest Hook Supports Jackhammer * Goniometer Simplifies Drillhole Dip Determinations * Slide Useful to Seal Hoist Room Cableway * Welding Rod Carrier Easily Made

Markets 106

Washington Reflections 108

News of the Industry 110

Personals 112

Obituaries 114

Letters 116

Regional News 118

Equipment News 158

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Publication Office: 210 E. York Street, York, Pa. Editorial and Executive Offices: 330 West 42nd Street, New York 18, N. Y. Cable Address: McGraw-Hill, New York. Branch Offices: San Francisco 4, 68 Post St.; Chicago, 520 N. Michigan Ave.; Los Angeles 14, Calif.: Pacific Finance Building, 621 So. Hope St.; Washington, D. C., National Press Building; Pittsburgh, Pa., 738-9 Oliver Building. District Managers: New York, T. E. Alcorn, F. W. Roets; Philadelphia, J. F. Cleary, W. A. Potter; Cleveland, W. M. Spears; Pittsburgh, W. S. Drake; Chicago, S. J. Alling; St. Louis, C. J. Ceash; San Francisco, J. W. Otterson.

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Aldwych House; Aldwych, London, W. C. 2, England
Cable Address: Backlash, Estrand, London

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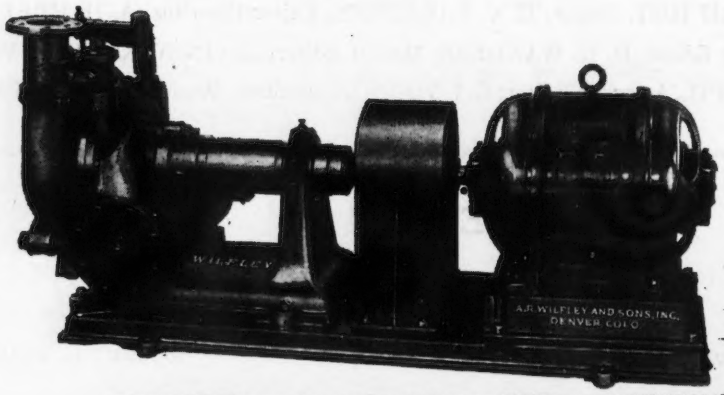

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ENGINEERING AND MINING JOURNAL

Evan Just, Editor

What Is Secretary Ickes Up To in Alaska?

SOMETHING MORE than his usual lust for a fight appears to be motivating Secretary Ickes in pushing at this time the Interior Department's program for establishing reservations for the Indians in Alaska, an account of which is given in our Washington news on page 108 of this issue. We are forced to believe that a desire to bring important areas in the Territory with rich resources under his own supervision, through the Department's Bureau of Indian Affairs, lies at the bottom of his endeavor, despite the plausible disclaimer bearing his signature that has already appeared in at least one of the papers of the Pacific Northwest. The Indian Bureau which started the action is now said to be merely a bystander, with those higher up directing each move. Even if the Secretary actually feels a deep solicitude for the Indians, any efforts to promote his program might well have been deferred until after the war. As it is, he has stirred up a hornet's nest in Alaska and has caused consternation among the white inhabitants. Repercussions are heard in Seattle and San Francisco and elsewhere along the Pacific Coast.

The country was already well into the war when, in 1942, the Department's Solicitor, Nathan R. Margold, apparently to open the way for claims by the Indians, rendered the opinion, at Mr. Ickes' request, that

" . . . aboriginal occupancy established possessory rights in Alaskan waters and submerged lands, and that such rights have not been extinguished by any treaty, statute, or administrative action. . . . Available evidence indicates that the possessory rights traditionally asserted by Alaskan natives are exclusive rights. . . . "

We were still deeper in the war when, in 1943, the Secretary, acting under the Wheeler-Howard Act of Congress of 1936, established seven reservations, including one known as the Venetie-Chandalar, north of Fairbanks, and containing 1,408,000 acres, this for a very small group of Indians. The remaining six reservations by name and acreage, are: Akutan, 72,000 acres of land and water; Karluk, 35,200 acres, likewise of land and water; Wales, 7,200 acres of land and 14,000 acres of water; Shismaref, 3,000 acres; and White Mountain and Unalakleet, both of which are as yet unsurveyed.

More recently, eleven claims for exclusive rights in various areas not included in the seven reservations have been made by Indians, of which three have been heard at hearings conducted by Department representatives. While these eleven claims are largely for fishing rights, they could be readily extended to include other resources. They cover most of the southeastern region, a district 120 by 450 miles in dimensions, which stretches from Prince Rupert to Skagway.

Within this extensive region lies the most populous part of Alaska, occupied principally by white settlers and their descendants since the Treaty of Purchase was signed with Russia 77 years ago. Most of the land is classed as forest, lying within the Tongass National Forest, though including mineral deposits and power sites, with fisheries in the adjacent waters.

When the purchase treaty was signed with Russia, it was without any strings with respect to the Indians. The Alaskan Indian today nevertheless votes and has the same rights as the white man and has never lived on a reservation. Yet large areas are now being set aside for him as reservations and he is being encouraged to ask for valuable exclusive rights by the legal finding of the Department which has been cited. All of which on the part of the Secretary is difficult to understand, save on the assumption that we made at the outset.

Let no one argue that Mr. Ickes lacks authority for his acts. As Secretary of the Interior he has extensive authority over the public lands of the Nation. The White Act of 1924, a conservation measure, gives him power over the fisheries, of which he is the "co-ordinator." And he has control over the natives through the Bureau of Indian Affairs. But his authority does not cover the forests, which are under the Department of Agriculture. Secretary Ickes is said to be continually striving to get control of the land which that Department's Forestry Service administers. Now possibly

we see the light. The lands we have been talking about are classed largely as forest, as previously stated. By establishing a reservation for the Indians, as he can do under the law, Mr. Ickes puts that particular tract and all it contains very definitely under his own Bureau of Indian Affairs, that is to say, under himself.

Moreover, by converting such a tract into an Indian Reservation, any mineral lands thereon not already staked can thereafter only be leased from the Government—that is, through the Interior Department. Otherwise they could be staked in the usual manner but subject to the jurisdiction of the Forestry Service. (Owners of previously existing valid claims and patented lands are protected.)

Thus Mr. Ickes works on the one hand toward a larger domain for Mr. Ickes, and on the other toward bringing the nation's mineral resources under Federal control. But the white resident, seeing the Territory's opportunity for him and his children shrinking so rapidly, is alarmed, and with good reason.

The Small Mine Must Be Financed

THE RECENT CONVENING of the Small Mine Finance Conference in Butte, Montana, served to bring to mind how conditions in the mining industry have changed since the 'twenties in respect to offerings of shares, whether for investment or speculation. Then the sky was the limit so far as the mine prospectus was concerned and it was practically impossible for the uninitiated to distinguish unaided between the strong, well-established enterprise, directed by competent men, and the wildcat proposition that lacked the backing of either ability or honesty, to say nothing of good intentions. "Let the buyer beware" was the rule, and this had been so for decades preceding, and if the "widows and orphans" lost their money, it was just too bad.

The legitimate industry realized that such conditions were not good for it, and the owners of many a likely prospect found it hard to raise the capital wanted for exploration and development. Again and again the need for "blue sky legislation" was a topic for conventions, and again and again such proposals got exactly nowhere, because of the difficulty of drafting legislation to curb the crook without also hobbling the honest prospector and promoter.

Finally "blue sky legislation" became an actuality, as the existence and functioning of the Securities and Exchange Commission has borne witness since 1933. Now the pendulum swung the other way. They curbed the crook and they hobbled the honest prospector, just as the wise men had said they would. It was the smaller ventures that suffered most. The years slipped by, and at last the other day at Butte representatives of all the interests concerned sat down together to see whether it was possible to loosen the strings a bit so that the honest small enterprise could breathe.

Never had there been such a meeting. The small mine operators and underwriters of securities met with officials of the S.E.C. and the investment commissioners of the individual states to determine how they could modify the regulations of the Commission and the various states to make the matter of financing easier. The story is related on page 110 of this issue. The results remain to be seen. Good fruit should yet be borne. It must be. It is in the small prospects, in the thousand and one shafts and adits in the hillside that perhaps were stopped a round too soon for lack of money—it is in these beginnings that much of the hope rests for the future growth of the domestic industry. Mining is a business wherein risks are deliberately taken with the eyes open. The way must be opened to a greater volume of legitimate speculation as well as investment.

Room for Improvement in Preventing Mine Fires

IN GLANCING through our news pages for the past six months, we note such fragments as these: " . . . fire destroyed the company's principal warehouse, and with it about $275,000 worth of supplies and equipment"; " . . . mill, which was destroyed by fire, . . . is to be rehabilitated"; " . . . the fire last July that destroyed most of the improvements which have been installed"; " . . . the fire that destroyed most of the shaft timbering" " . . . construction has been started to replace the hoist house, headframe, and coarse ore bins, and to repair the damage to the crushing plant" (all caused by fire); " . . . the mid-September fire destroyed the office, blacksmith and machine shops . . . causing a loss of about $10,000."

Next we note an address before the mining section of the National Safety Congress on October 5, in which Carl Belser, engineer with the Mineral Production Security Division of the Bureau of Mines, reported that in the course of 741 mine inspections made since August, 1942, 7,567 written recommendations were made, of which 4,835 pertained to fire prevention. He added that 41 types of fire hazards were noted, and that 3,697 examples of these 41 types were found in mines examined.

In enumerating common fire hazards, Mr. Belser

mentioned that 484 mines lacked fire extinguishers, and many failed to conduct fire drills.

"Other causes of fire in mines," he reported, "were brush and weeds near buildings, the presence of rags and paper, absence of fire alarms, lack of fire lines and hydrants, improper installation of heating equipment, transformers, and electric wires, poor housekeeping, lack of water barriers, inadequate supply of water hose, lack of inspection of fire-fighting equipment, lack of fire doors, lack of restrictions on smoking, and improper storage of oil and grease."

It is encouraging to note that local managements complied with the majority of recommendations submitted. Undoubtedly a well-trained fire-fighting crew with adequate equipment, and frequent inspections by a responsible individual would constitute the "ounce of prevention" needed to eliminate fire hazards.

MILLING AROUND

Fishing for suckers, a Toronto firm offers to send its selections of mining shares for six months for only $2, payable in advance "to cover postage, etc." It promises to tell you what to buy and when to sell and will "leave it to your honesty" to send it 10 percent of the net profits. If you lack adequate facilities for trading in your own community, these people say they will be delighted to connect you with a brokerage firm without additional charge.

Enthusiasm abounds in Mexico for the projected campaign against illiteracy. Almost half of the 19,500,000 population can neither read nor write, the Economy Ministry states. It is planned that, beginning next February, everyone who can read will teach some person who cannot. A top executive says that his company's employees seem to have no difficulty in reading their collective contract; it is a common thing to have a man pull out the little book and point to something to which he claims he is entitled.

Canada's 12-sided "nickels" take the visitor by surprise. A wartime substitute for the 5-cent pure nickel coin, they are made of the so-called "tombac" or "tombaga" alloy consisting of 88 percent copper and 12 percent zinc. When nickel again takes its place in coinage, they can be readily converted into bronze coin by adding tin and copper in proper proportions. Their peculiar shape was adopted to prevent confusion with other coins.

A Congressional committee has consulted legal counsel and has been assured that the liability of WPB as a contracting agency under the Contract Settlement Act did not begin with the effective date of the Act, but is retroactive to cover all agreements made by WPB.

Highgrading is a source of considerable loss to many gold producers, especially in Ontario. There the Mining Commission has reported to the Provincial Government that a million dollars' worth of the metal is stolen annually. It recommends the creation of a special body to investigate and prosecute. That body, once set up, should realize that a beautiful specimen exerts a powerful pull which is not necessarily connected with the idea of profit.

Current Army policy is not to move any ferrous scrap out of the war theater, but to stack it up for future disposal, probably abroad. Because of personnel and shipping shortages, brass scrap returning to this country has declined from 7,500 to 2,500 tons per month. Only small quantities of copper, aluminum, lead and zinc are being returned here.

Labor and management in the mining industry apparently agree that stockpiles should be created to avert shutdowns after the war. However, Reid Robinson, president of MM&SW union, goes a bit farther by advocating not only national stockpiling, but an "international metal pool where the world at peace can obtain its supplies."

Domestic production of titanium pigments, we understand, is exceeding that of zinc and lead pigments combined.

Half a century of achievement by Butler Brothers, of St. Paul, at first in the field of construction and then in that of iron mining in the Lake Superior region, is commemorated in the Golden Anniversary edition of "The Butler Miner" just out. Dedicated to "the old-timers" of the firm's employees, it contains a striking presentation of the six pioneering Butlers, one of whom, Pierce, became a justice of the United States Supreme Court, and of the second generation of the family. Butler Brothers, the firm, still pioneers and has long been in the forefront where iron ore beneficiation and new advance in open-pit iron mine operation have been concerned.

The Index for the 1944 volume of E. & M. J., which closes with this issue, is being printed separately and should soon be ready for distribution. Owing to the shortage of paper, it will be sent only to those readers who ask for it. Such requests should be addressed to the Editorial Department, Engineering and Mining Journal, 330 West 42nd St., New York 18, N.Y.

UNUSUAL design and construction problems heighten interest in Cananea's 12,000-ton concentrator.

How Cananea Develops Newest Porphyry Copper

R. H. Ramsey, *Associate Editor*

SOMEHOW the rumor has got around in the mining industry that down in Sonora, Mexico, the Cananea Consolidated Copper Co. is developing a low-grade copper orebody into an open-pit mine and erecting a concentrating plant that together will be about the last word in that kind of mining and milling. *E.&M.J.* is now in a position to substantiate that rumor, for the new Cananea project does, indeed, incorporate some altogether new elements of design and operation, and it also employs the best examples of existing techniques.

Not that Cananea is any stranger to new ideas; its experience has been quite the contrary, in fact. It is regrettable that lack of space prevents a more complete history of the many significant developments that first saw daylight at Cananea, but there are a few that demand mention, at least. For example, A. S. Dwight was Cananea's general manager in 1905, when R. L. Lloyd was smelter superintendent, and the first models of their sintering machines were built at Cananea. Wet smelting of copper concentrate was first done successfully at Cananea in 1924, under the direction of A. D. Wilkinson, smelter superintendent, and Henry Thurston, his assistant, who were quick to take full advantage of this new technique.

One of the earliest flotation plants in the industry was operated for a time in Cananea, where it was known as "the grease plant." It was the object of much coarse humor, but it was a forerunner of an enormous industry. In addition, after flotation was established firmly at Cananea, experiments there resulted in the first separation of molybdenite from the copper concentrate, a practice now in use at a number of mines.

Production of the new open pit will be 12,000 tons daily of ore containing about 1 percent copper, mostly as chalcocite. In the entire operation, about 22,000,000 tons of ore and 35,000,000 tons of waste will be mined. A new concentrator has been built to handle this output, but the flotation concentrate from the mill will be smelted in the existing Cananea smelter, which had sufficient reserve capacity for the job. Power for the new operation is

STRIPPING WASTE to expose Cananea's 22,000,000 tons of 1 percent ore moves rapidly, efficiently.

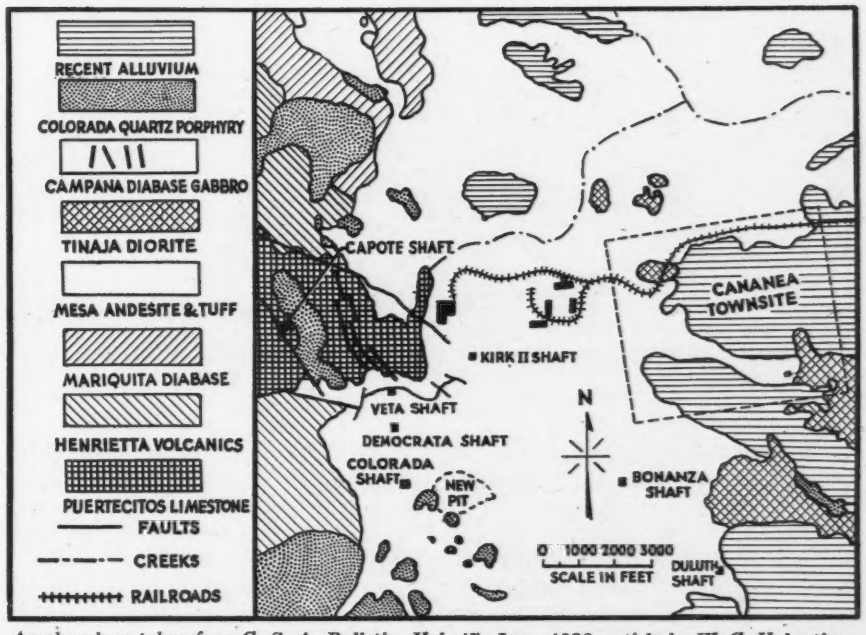
generated by a steam-driven turbine-generator installed as an addition to the 4-C power plant.

All in all, in both design and execution, the Cananea project is one of the best handled, most interesting mining ventures in years.

IN THIS ARTICLE

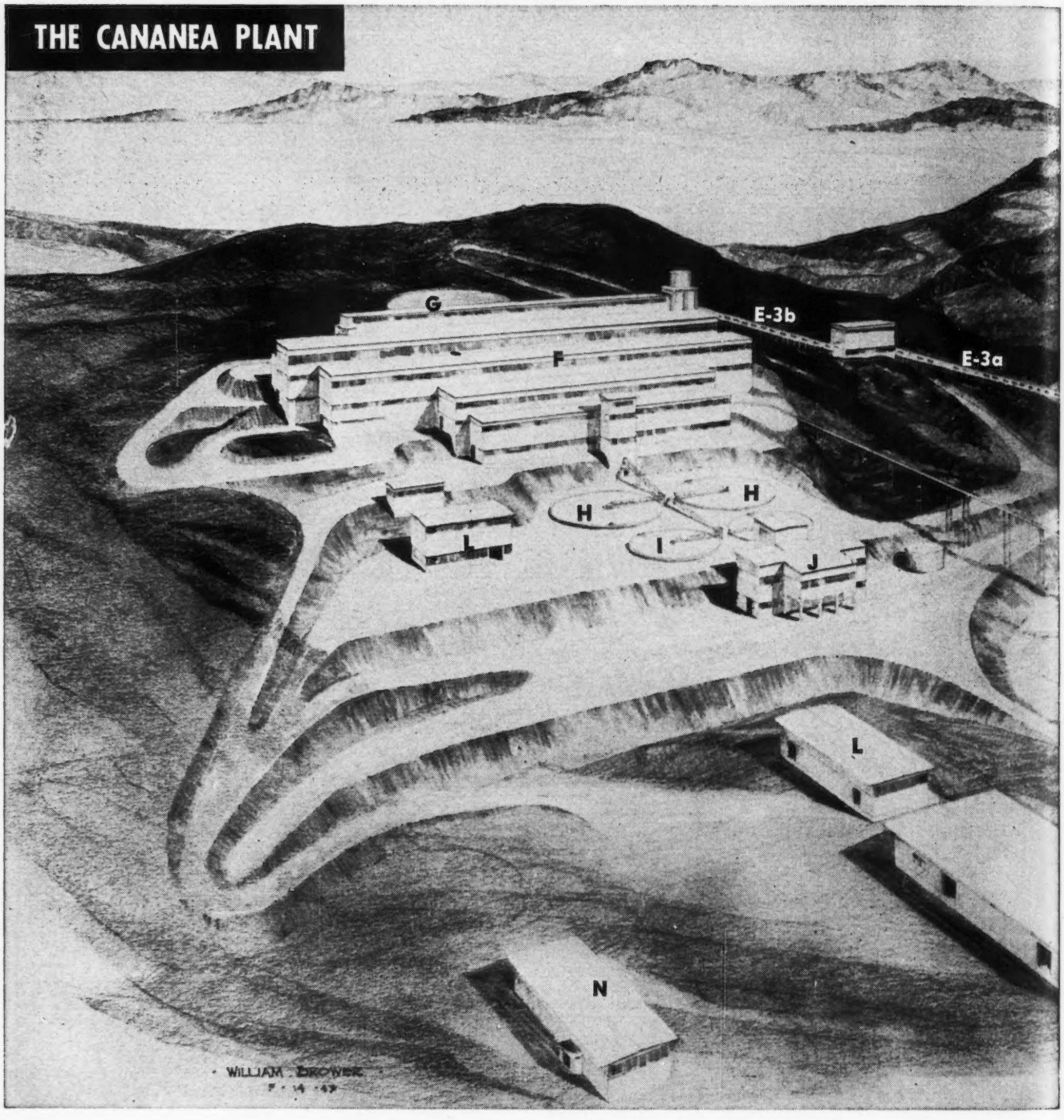
Introduction..... 74
Geology..... 75
Plant Design 76
The Mine 78
Mining Methods..... 78
The Skipway 81
Primary Crushing Plant 82
Secondary Crushing Plant 83
The Concentrator 84
Smelter and Power Plant 87
Construction 87
Conclusion 87

GEOLOGY OF THE MINE



Areal geology taken from G. S. A. Bulletin, Vol. 47, Jan., 1936, article by W. G. Valentine.

The 4-C mining operations are situated on the eastern slopes of a range of mountains about 30 miles south of the U.S.-Mexico border at Naco, Ariz. Elevation at Cananea is about a mile. The district has produced copper for many years, and since about 1927 the company has been mining ore containing about 8 percent copper from the Colorada orebody, which is shown on the accompanying geological map. This relatively high-grade orebody occurs in a breccia pipe formed as the result



of the intrusion of a plug or stock of quartz porphyry into the surrounding andesite of Tertiary age.

Surrounding this porphyry plug is an aureole of low-grade copper ore that forms a sort of halo completely around the old workings of the underground mine. This is the ore that the 4-C department will mine, although only about half of the halo will be removed by open-pit mining.

The ore mineral is primary chalcocite, found in a network of seams and disseminations in the andesite. Although there are no veins, the mineralization is never over 300 ft. thick in any one concentration, a circumstance that complicates mining somewhat, for close sampling will be necessary as mining of the orebody progresses.

A little secondary chalcocite is found deposited around crystals of pyrite. There is no chalcopyrite in the ore and very little molybdenite. Oxide copper will cause no trouble in the new mill because it has not been found in the orebody to any significant extent.

R. B. Mulchay is chief geologist at Cananea, and T. A. Dodge is assistant geologist.

PLANT DESIGN

Before describing the mine, it is pertinent to explain several factors that forced Cananea's engineers to design the plant and erect the buildings in a manner and in locations that are unusual in many respects.

Truck haulage is used in the pit because of the relatively small size of the operation (compared with Ajo, Utah Copper, Morenci), and because of the steep grades (8 percent) required on access roads and haulageways. To avoid much up-grade

haulage, the primary crushing plant was located adjacent to the orebody with its dumping point about 120 ft. above the lowest ore in the pit.

The problem then arose of getting ore down from the pit, the highest point of which will be about 1,075 ft. measured on the slope above the crusher. Ground slope down to the crushing plant is 30 deg. The prospect of heavy tire, engine, and brake maintenance, coupled with the certainty of traffic problems on a long serpentine haulage road, ruled out trucks as a possibility.

Two other methods considered were a tremendous chute down the mountain, and a conveyor system. Control of flow in a chute seemed impossible, and safe delivery at the bottom also posed a problem. Inasmuch as the maximum size of rocks to be handled may be equivalent to a 5-ft. cube, construction of conveying equipment of sufficient size and strength also seemed to be impracticable.

The one remaining scheme that offered no prohibitive obstacles was an inclined railway or skipway. Although use of such equipment on so large a scale is new to metal mining, no experimental design or questionable practice is involved. A complete description of this development is given elsewhere in this article.

The location of the crushing plant having been fixed and ore transport provided for, subsequent milling units were spotted at convenient points on the hillside near the primary crusher in accordance with the usual considerations of obtaining sufficient height for tailings disposal and a ground slope favorable for efficient handling of ore in process.

The most compact plant layout

Men Responsible for Cananea Project

DESIGN

For Cananea Consolidated Copper Company, S. A.

Wilbur Jurden, *chief engineer in charge of design.*
L. R. MacLeod, *office engineer.*
A. P. Svenningsen, *chief draftsman.*
S. F. French, *electrical engineer.*
B. F. Koch, *power plant engineer.*

CONSTRUCTION

For Compania Bechtel, S. A.

L. J. Bares, *resident manager.*
E. E. Nichols, *general superintendent.*

For Cananea Consolidated Copper Company, S. A.

W. M. Healy, *construction engineer.*
James Wordie, *assistant engineer.*

OPERATION

For Cananea Consolidated Copper Company, S. A.

Albert Mendelsohn, *president and general manager.*
William Wraith, Jr., *assistant general manager.*
A. E. Millar, *pit superintendent.*
Guy H. Ruggles, *director of concentration.*
W. A. Wasley, *superintendent of new mill.*
Frank H. Day, *smelter superintendent.*
J. T. Wakefield, *power plant superintendent.*
Michael J. Ashe, *assistant power plant superintendent.*

had to be abandoned, however, because the bedrock on the concentrator site was found unsuitable for the support of a heavy structure. The only other site possible was the one on which the concentrator now stands. It is high enough to allow for tailings disposal, it provides a firm foundation, but, as shown in the plant layout drawing, it required that long belt conveyors be built to bring ore to it from the secondary crushing plant. Incidentally, the tailings disposal problem was neatly solved in a manner that will be discussed further along in the article.

One of the most vexing difficulties under which the plant was built was that all buildings were to be constructed of reinforced concrete and timber. Steel construction was ruled out by the WPB. Against their will, therefore, the designers had to provide for concrete, and all buildings have been built of it. Despite the complications thus made unavoidable, an excellent job of design and construction was done, and all concerned may well be proud.

THE MINE

Following thorough exploration of the orebody by both churn and diamond drilling, a bench map of the proposed mine was made, showing ore area and grade. The limit between ore and waste was fixed at 0.6 percent copper, and the limits of the pit were set so that the completed operation will have yielded 35,000,000 tons of waste and 22,000,000 tons of ore averaging about 1 percent copper, a waste-ore ratio of about 1.6 to 1.

To develop the pit to a point where 12,000 tons of ore could be sent daily to the crusher, about 10 or 11 million tons of waste had to be stripped. The north section of the pit was scheduled to be stripped first, and it will supply the mills' 12,000-ton daily requirement for the first period of operation. When mining of ore in the north section has begun in earnest, stripping of the south section will begin and eventually the whole pit will be evened out. Following the preliminary stripping of the north section's 11,000,000 tons of waste, the waste-ore ratio will have been reduced to 1.1 to 1. Ore is hauled out of the pit to the north; waste is hauled out to the south and dumped into nearby canyons.

The general layout of the pit as it was in June, 1944, is shown in an accompanying map, together with the proposed pit limits. Work will be carried on so that at completion the pit walls will have an over-all slope of 60 deg., for, by so doing, waste removal will be held to a minimum. It is hoped in operation to make the bench faces, which are 40 ft. high, stand at 70 to 75 deg. This will allow a 25-ft. berm every second bench in the final pit wall, a section of which is shown in the accompanying sketch.

DATA ON MINE OPERATION

CHURN DRILLING	
Feet of hole drilled per shift	67
Feet of hole drilled per bit	85
Tons broken per ft. of hole drilled	30
BLASTING	
Tons broken per lb. of dynamite, medium-hard rock (waste and ore)	4.2
hard rock (ore)	3.1
LOADING	
Tons mined per shovel per shift	3,700
TRUCKING	
Trips per shift per truck	24
Tons per truck per trip	30
Tons per truck per shift	720
Fuel oil per truck per shift, gal	25–30

Cost of moving ore to crusher or waste to dump is less than 20¢ per ton.

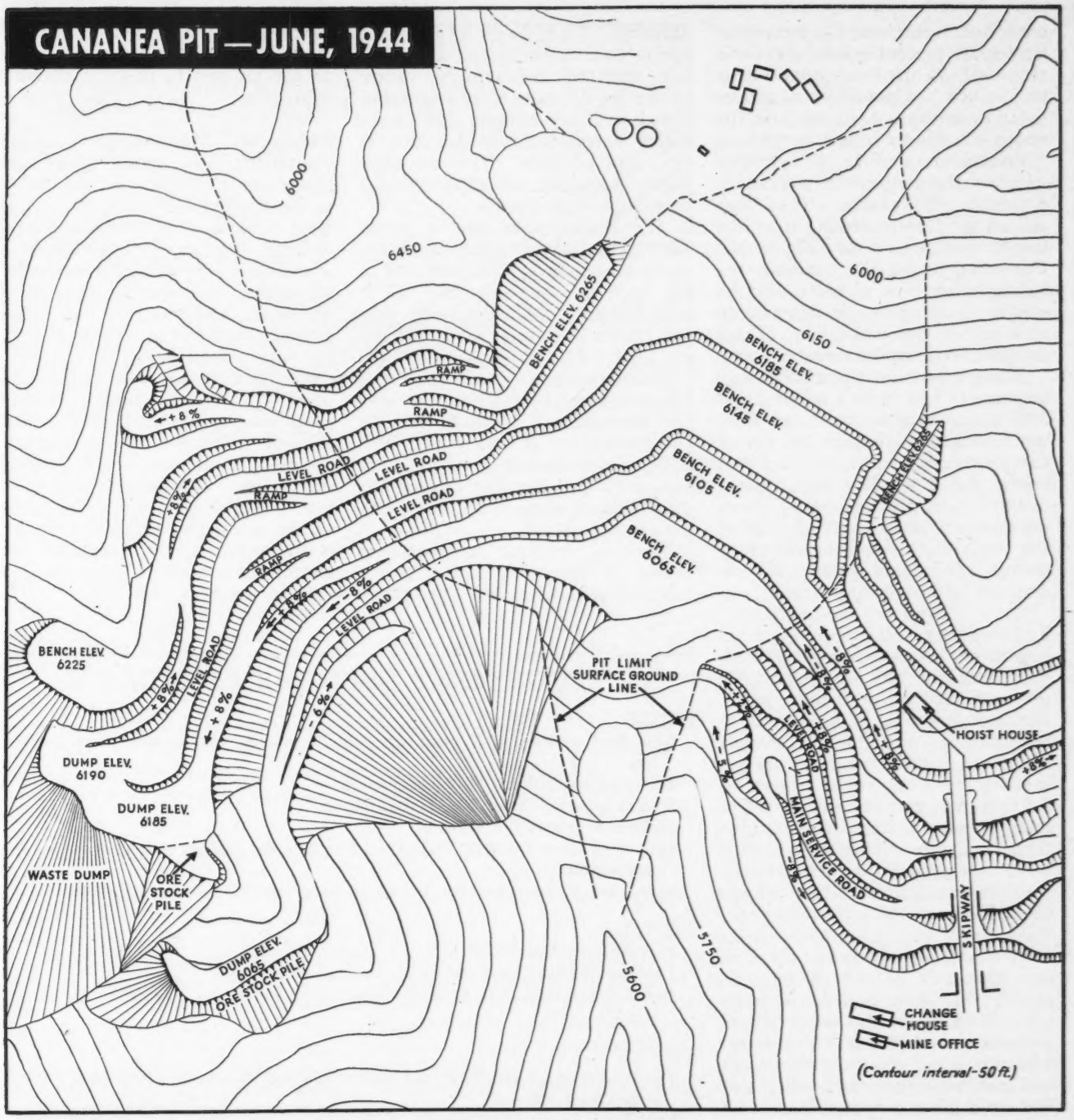
MINING METHODS

All important items of equipment used in the mine are listed in an accompanying table.

Drilling. Holes for bench blasting are put down with electric churn drills on 15-ft. centers to the level of the next lower bench plus 4 ft. The holes are 9 in. in diameter, and the average horizontal distance between each hole and the toe of the bench is 25 ft. Because surface rock is usually shattered by the last blast on the bench above, casing is set in the first 5 or 6 ft. of each hole. Much of this casing is salvaged after each blast, straightened, and re-used.

The drills put down 65 to 70 ft. of hole per shift, and average use for each sharpened bit is 80 to 90 ft. The standard set of drill tools (two 16-ft. stems plus a 3-ft. bit) has been modified by welding the 16-ft. pieces into one 32-ft. length, to which the bit is attached. Total weight of the tools is 4,000 lb. A complete bit sharpening shop is maintained near the mine.

At Morenci, it has been reported that the same type drills put down 85 ft. of 9-in. hole per shift with 60 ft. of hole per bit sharpening. These

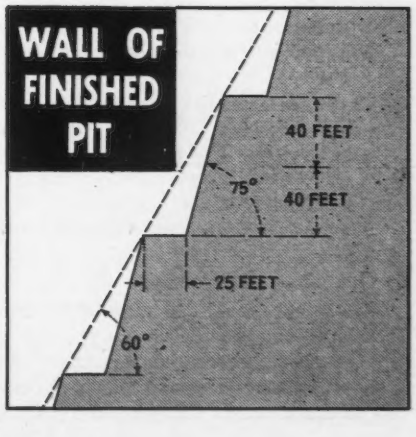


CAREFULLY PLANNED, the Cananea pit provides easy access for the 30-ton trucks to both waste dumps at left and skipway for ore at right. Ore was stockpiled for a time as reserve for early mill operation.

holes are 58 ft. deep, 15 ft. apart, and have 11 ft. burden at the toe of the lower bench.

Each hole at Cananea is sampled throughout its length, one sample being taken and assayed for each hole. A sample splitter on the drill takes continuously about a $\frac{1}{18}$th cut of the sludge. Assays are returned for each hole before any one round is fired.

The jackhammers mentioned under mine equipment are used for secondary blasting of unwieldy boulders, and the wagon drills are used for relieving excess burden,



where necessary, at the toe of the bench. Portable compressors supply air for these drills, and Jackbits are used on all pneumatic drills.

Blasting. One 50-lb. case of powder fills a 9-in. hole to a depth of about $1\frac{1}{2}$ ft. At Cananea, the drill holes are deck-loaded, about 5 cases going into the bottom of the hole, 2 cases going in halfway up, and $1\frac{1}{2}$ cases going in about 10 ft. above these. Earth and sand stemming is used between decks.

In holes drilled in waste rock 40 percent special gelatin dynamite is

used, but in ore, which is somewhat harder, 60 percent special gelatin is required. In the hard ore, 3.1 tons are broken per pound of dynamite used; in medium hard ore and the waste, 4.2 tons are broken per pound.

Primacord, tied to a dynamite stick at the bottom of each hole, detonates the charge. The loose end of the fuse projecting from the loaded hole is tied carefully to the Primacord trunk line running the length of the line of holes, and an electric blasting cap is fastened to each end of this trunk line. These caps are fired simultaneously.

Primary blasting is permitted only between 11 and 11:30 a.m., or 3 and 3:30 p.m., because at those times the underground miners are out of the stopes only a few hundred feet below the new pit. The "earthquakes" caused by the heavy blasts sometimes shake a few rocks out of the backs of the stopes unde neath the pit. Secondary blasting of boulders can be done at any time.

Excavating. Broken rock is loaded by the four 4½-yd. electric shovels at the rate of about 3,700 tons per shovel per shift, which compares favorably with many U. S. operations. Power for the shovels and churn drills is brought to the pit edge at 11,000 v., stepped down to 2,300 v., and carried into the pit in semi-permanent lines, from which three-conductor rubber-covered trail cables carry power to the shovels. Another transformer station reduces the 2,300 v. to 440 v. for the drills.

At each shovel station, it is attempted to have trucks backed in on either side of the hovel constantly, one being loaded, one waiting. Working with each shovel are: one shovel runner; two pitmen, who watch out for the power cable and spot rucks; one shovel oiler; and one cat skinner, who bulldozes loose rock out of the way and sweeps up after the shovel. The shovel operators keep track of the number of trucks loaded.

One can't help being impressed with the ease in which the 30-ton trucks are handled. The pitman spots trucks by standing so that the truck driver will hit the right spot by aiming just past him. The driver never looks to see where his truck is going; he aims to just miss the pitman and stops when the pitman flags him down.

The shovels run 24 hr. daily; at night they work under floodlights on the shovel booms. Floodlights are also placed on the waste dumps, on the churn drills, and at strategic location throughout the pit.

Hauling. The fleet of 30-ton trucks used for hauling ore and waste has operated satisfactorily, except that some difficulty has been experienced with the motors, due to the heavy demands made on them at the high altitude. The manufacturers' engineers are experimenting to eliminate the trouble.

The trucks make use of power steering and a telescoping self-dumping arrangement. The back end of the body is open, but the tail is raised slightly. The eight rear tires are 1,400 x 24 in size; the front tires are 1,300 x 24. Air brakes are used.

Maintenance of haulage roads receives careful attention, because the management well understands the importance of this work. The huge tires bruise easily despite their size, and hey are also one of the most difficult items to obtain just at present.

Auxiliary trucking equipment is shown in the table. Most items have obvious uses, but the Athey Mobiloader, for example, is used to load blast hole stemming for haulage to the pit and to pick up concrete aggregate.

Repair and Maintenance. Drill sharpening and repair shops are located near the pit. In the sharpening shop churn-drill bits are swung from a boom attached to a central column, around which arranged in a circle are a heating furnace, a bit sharpener, a tempering furnace, a quenching bath, and cooling racks. Bits are tempered to a depth of 1 in. by quenching in water.

Complete garage and shop equipment is available for major overhaul of all the various truck sizes in use, as well as the Caterpillar tractors, the graders, and other earth-moving equipment. It was noted that worn shovel dipper teeth are being built up by welding at present, although it is intended merely to replace worn teeth with new ones as soon as such supplies are more plentiful.

EQUIPMENT USED IN CANANEA PIT

DRILLS

- Nine Bucyrus-Erie, 42-T blast hole drills, complete, with 40 spare 9-in., 500-lb. bits.
- Thirty Ingersoll-Rand, JB-5 Jackhamers.
- Twelve Ingersoll-Rand, FM-2, wagon drills.
- Jackbits for above I-R drills.
- Drill steel from Crucible Steel Co.; 1-in. hex. for Jackhamers, 1¼-in. round for wagon drills.
- Four Ingersoll-Rand portable air compressors, two GK-105, two HK-315.

SHOVELS

- Four Bucyrus-Erie 120-B, 4½ cu.yd. electric shovels.
- Two Bucyrus-Erie, 54-B, 2½ cu.yd. diesel shovels.
- One Harnischfeger, 855, 2 cu.yd. diesel shovel with crane attachment with 60-ft. boom.

TRUCKS

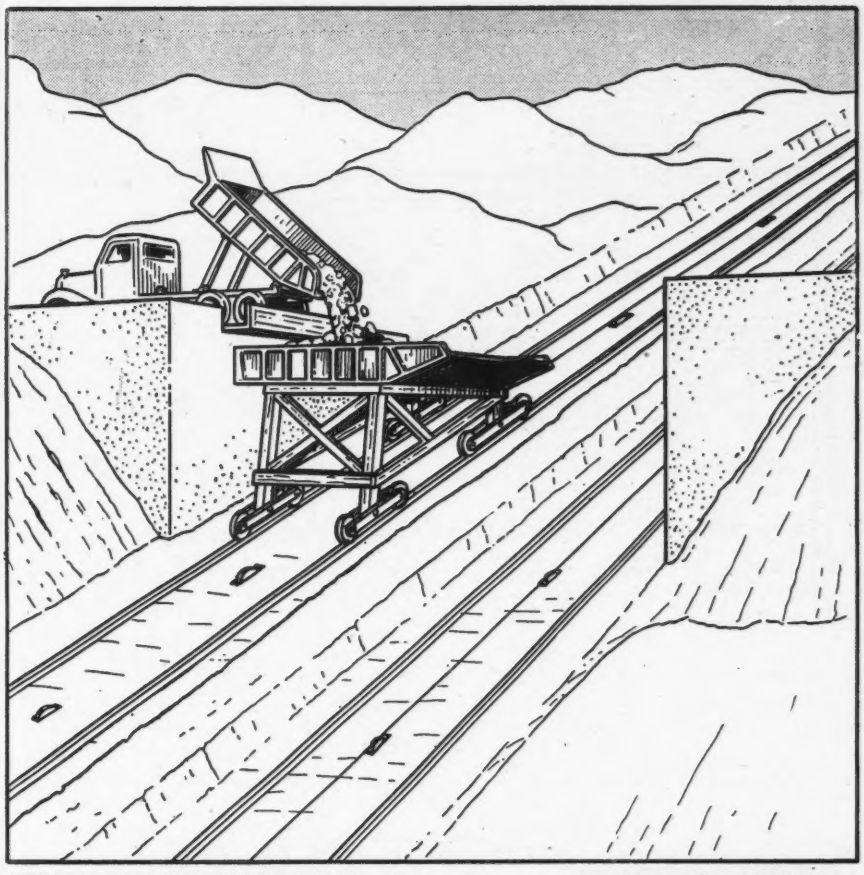
- Twenty-five Mack FCSW, 30-ton mine trucks with Waukesha-Hesselman 200-hp. semi-diesel engines.
- Four Mack EG flat-back trucks.
- One Mack 1,000-gal. sprinkler truck.
- One Mack 1,000-gal. oil tank truck.

SKIPWAY

- One Ottumwa Iron Works single-drum hoist.
- Two 600-hp. Westinghouse motors for above, 2,300 v., one dynamic, one regenerative.
- Three special skip cars from Pressed Steel Car Co., with one spare body and dumping apparatus.
- Crane rail for skip track, 3,600 ft., 171-lb., Bethlehem Steel Co.

MISCELLANEOUS

- Seven D-8 Caterpillar tractors, with LeTourneau bulldozers, rooters, and one grader.
- One Athey Mobiloader.
- Rubber-covered, 3-conductor power cable; 6,000 ft. of 2,300 v.; 6,000 ft. of 600 v. from Anaconda Wire & Cable Co.
- One power cable vulcanizer from Sullivan Machinery Co.
- Four welding sets: two Westinghouse, 300-amp.; two Hobart, 300-amp.; portable.



TRUCK DUMPING STATION, where skips receive 30-ton load 36 times an hour for minimum flow of 1,080 tons hourly down to crusher. Loading of one skip, dumping of other are simultaneous.

THE SKIPWAY

The most novel feature of the new Cananea project is the skipway, the necessity for which was discussed under "Plant Design." The system, as designed, consisted of two 40-ton skips (with a normal carrying capacity of 30 tons of ore) on separate tracks with balanced lowering governed by braking action on a hoist at the top of the slope. Location of the skipway and the three truck-dumping points are shown in the mine and plant layout drawings.

The possibility was considered of using the skipway as an elevator to lower trucks to the crushing plant for dumping, but the idea was discarded in favor of a car with a dump body. Side-dump cars of suitable capacity are used a many open-pit mines, but they are required to dump only once or twice a day, not 18 times an hour, as is the case at Cananea. For maximum dependability, therefore, it was decided to use a simple one-piece body, similar to that of a dump-truck, and dump it by means of a stationary dumper.

The cars dump into a common pocket between the tracks, and a dumper is placed outside each track. For smooth positive action and to avoid violent surges of electrical power demand, a hydraulic dumper, rather than an electrical hoist system, was used. The unit includes a pneumatic accumulator, a crosshead, guides, a railroad-car coupling grip, and a hydraulic cylinder below the crosshead. The grip engages a short, heavy bar on the car body.

Though the basic design of the hydraulic dumper is simple, the details required extensive planning. Stroke of the dumper is long in order to raise the car body to a steep angle for clean discharge. Limit switches govern acceleration, deceleration, and reversal. Oil is the fluid used, and high pressure is applied to avoid a large piston diameter. Indicating lights and electrical interlocks make the pushbutton operation of the dumpers as foolproof as possible.

For dumping, the car is lowered so that its two spring bumpers rest against a concrete buttress. The springs are restrained to prevent excessive push-up when the load is dumped. If the car were left hanging on the rope, release of rope tension upon dumping the car would yank it far enough up the slope to disarrange the dumping apparatus. Rope tension is therefore relieved by overrunning the hoist slightly when the car comes to rest.

The dumping-station operator is placed behind an observation port set below the main floor overlooking the crusher and opposite the dumping pocket. Though the operator cannot see the dumpers, his control board shows when a skip is ready to dump, and the important point here is to have the crusher feed opening under observation so that dumping can be halted if rocks jam across it. Auxiliary stations for manual operation of the dumpers are also provided for emergency use.

The skipway's 171-lb. crane rails are set on wooden ties held down by removable bolts to concrete beams except at the road overpasses, where steel trestles have been built. Anti-creep lugs bear against the ties. Rail joints are butt-welded to clear the car's safety brakes, but expansion joints are provided in the rails adjacent to the trestles.

Automatic brakes are provided on the skip cars to prevent possibility of a runaway. These brakes are attached to the chassis of the car, and their jaws inclose the head of the rail. The pull of the rope holds the jaws open, but release of rope tension permits a spring-and-lever system to clamp the jaws to the rail and stop the car from full speed in less than a car length.

The loading stations, three in number and 120 ft. apart vertically, are designed to permit trucks to dump into either skip. A removable projecting cantilever extension to the concrete loading platform is run out to allow trucks to dump into the center of the skip. Subsequent design may make these extensions retractable to avoid fouling the skip. The generous dimensions of the skips (40-ton capacity for a 30-ton load) will prevent spillage of rocks large enough to be troublesome on such a steep slope.

At the top of the skipway, the hoisting cables lead off to the hoist house at an angle so arranged as to guide both ropes to the single-drum hoist in the shortest possible distance with a minimum of guide sheaves. Sheaves at the bend are 12 ft. in diameter; smaller sheaves give support on the slope, and there are 3-ft. fleeting sheaves between the bend and the hoist.

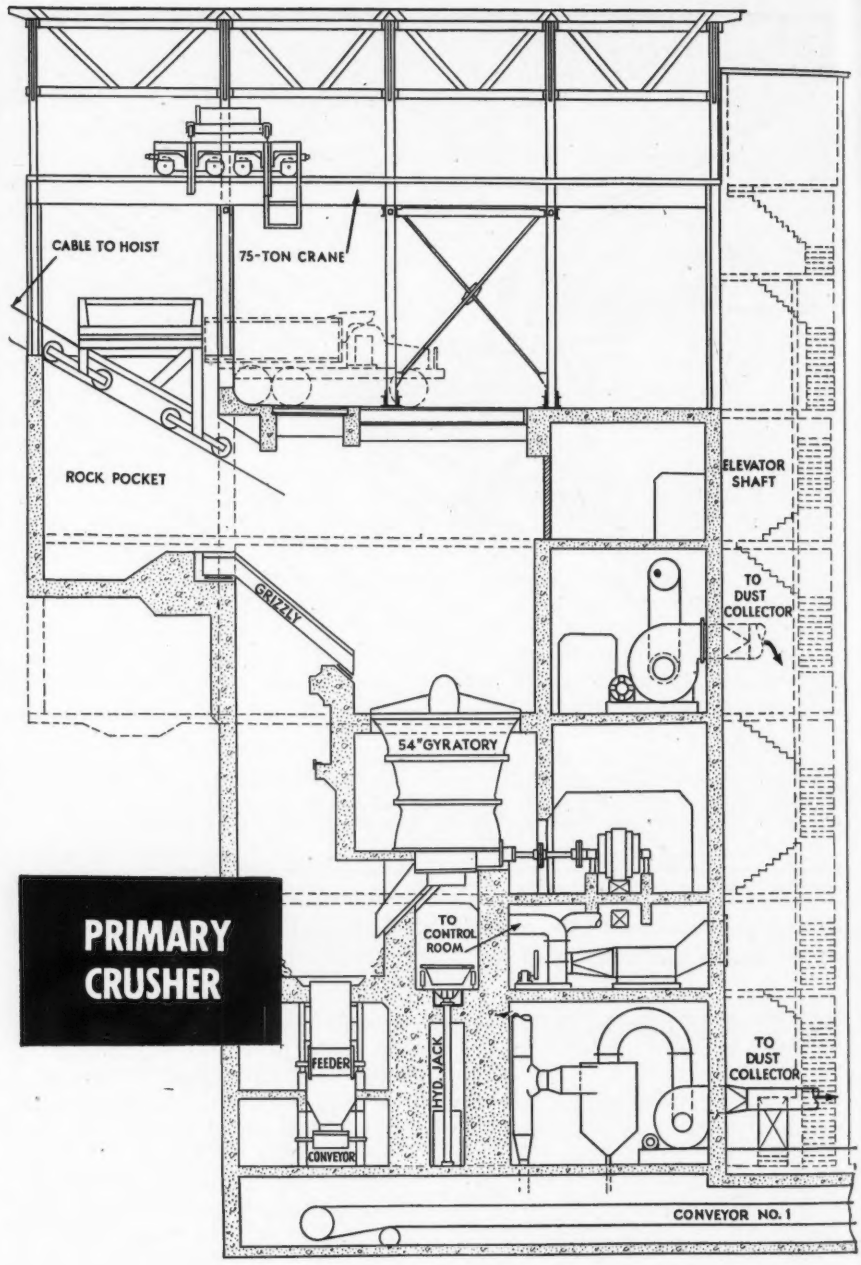
The hoist has a 12-ft. drum to suit the 2-in. wire rope used. Each rope is separately dead-ended to the drum, one at each end; one rope overwinds, and the other rope underwinds, with a few empty grooves between. The

two 600-hp. motors have no work to do normally except to provide dynamic or regenerative braking to relieve the mechanical brakes. Either of the two large drum brakes is capable of stopping the descending loaded skip. These brakes are manually controlled by the operator, but automatic control takes over if the skip is not decelerated at the proper time and rate.

When the cable lengths are at a minimum, ore will be loaded from the highest station, which will be the first one used. Loading and dumping operations will proceed simultaneously. It is possible, of course, to load from another platform without changing cables, but in that case loading and dumping will not synchronize and the haulage rate will be somewhat decreased.

The loading stations have been arranged to provide for a long period of service at each point. They are 120 ft. apart vertically, and each station therefore serves three of the 40-ft. benches, one above the station, one level with it, and one below. In addition, trucks from the two lowest benches will eventually dump directly into the crusher pocket.

Because this is the first time that a metal-mining company has used an ore-transport method such as this on so large a scale, the operation of the Cananea skipway will be watched with interest throughout the industry.



CAPACITY of the primary crusher is 12,000 tons per day in two 8-hr. shifts. Trucks (dotted line) will be used to bring ore from the pit's lower levels and to deliver equipment and supplies.

PRIMARY CRUSHING PLANT

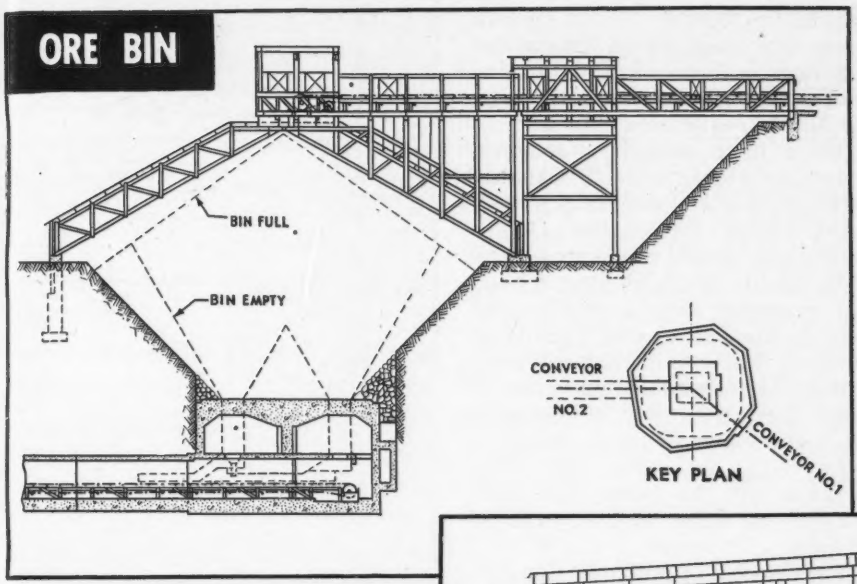
Because the skipway bringing ore from the Cananea pit is on a 30-deg. slope, plenty of headroom was available for the coarse-crushing plant, and conveyor length could be held to a minimum. However, except for the differences in the means of delivering ore, the basic conditions governing the Cananea plant were nearly the same as for the corresponding plants at Chuquicamata and at Morenci. In fact, the same staff designed all three plants, so full advantage could be taken of earlier design and operating experience.

Comparison of Cananea with Morenci is inevitable, but in the primary crushing plant, at least, there is very little difference. As shown in the flowsheet, ore is dumped into a pocket, from which it slides over a grizzly set on a 40-deg. slope into a 54-in. gyratory crusher. Grizzly undersize joins the single crusher discharge (double crusher discharge at Morenci, where headroom was more precious), and is fed by a pan feeder to a conveyor leading to the 8,000-ton coarse-ore bin. Capacity of the primary plant is 12,000 tons in two 8-hr. shifts.

A 75-ton crane in the primary plant serves for crusher and grizzly maintenance and for hooking jammed rocks out of the crusher pocket. The crane also travels out over the skipway so that cars or bodies can be replaced without serious delay. A freight elevator for small items of equipment and a hydraulic jack for the crusher eccentric are provided in the same manner as at Morenci and Chuqui. Trucks may be driven directly on to the upper floor of the crusher building.

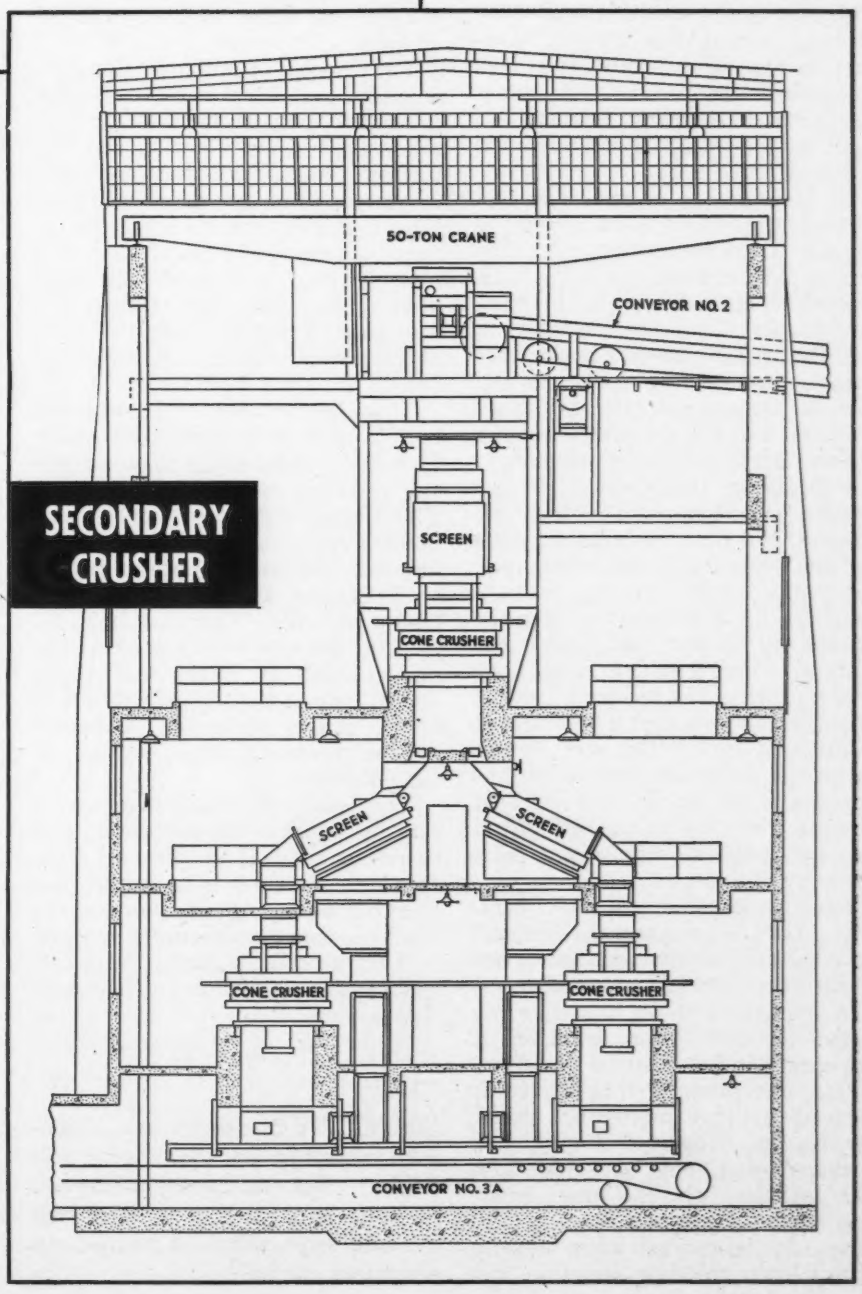
An efficient dust-control system is provided for both primary and secondary crushing plants and for the feeders under the coarse-ore bin. The crusher drive motors and the electrical control rooms are provided with washed air for ventilation, and a slight positive pressure is maintained in these rooms to exclude dust. Dust from the dry collectors is discharged to the conveyor belt. Dust from the wet collectors is piped to a

SECONDARY CRUSHING PLANT



ROCK and rock-fill form the walls of this 8,000-ton storage bin located between primary and secondary crushers. Four pan feeders draw off ore at bottom.

COMPLETE spare crushers are available for either standard or short-head cones in order to eliminate long repair shutdowns. Crane lifts stalled crusher bodily to repair bay, sets in a new one.



tank at the secondary crushing plant and from there pumped to the flotation circuit at the concentrator.

Each crushing plant has a gravity-flow lubricating system with circulating pumps returning the oil from sump tanks to head tanks. Evaporative coolers and oil filters are used. The conveying system in both plants has electrical interlocks, magnetic head pulleys, and a magnetic detector.

Between the primary and the secondary crushing plants there is an 8,000-ton storage bin, which is merely a conical hole in the ground of sufficient depth that no tripper is required. A heavy concrete structure at the bottom incloses the four 48-in. pan feeders that draw ore onto the 48-in. conveyor leading to the secondary crushing plant.

Although it is quite similar to one unit of the Morenci fine crushing plant, the Cananea econdary crushing plant has one important difference. This is in the provision made for changing the cone crushers bodily whenever repairs are necessary. This arrangement will assure operation that for all practical purposes will be without interruption, and the original cost of the plant has been held to a minimum.

One other point to which particular attention was given was the design of chutes in this plant. Vertical fall of crushed or screened material has been provided to the maximum extent possible, even at the sacrifice of some headroom. There should be no clogged chutes in the Cananea plant.

Every effort was made in designing the plant to provide equipment of ample capacity, yet not to include anything unnecessary. The war forced the use of some substitute materials, but operation will not be handicapped thereby.

(Continued on next page)

THE CONCENTRATOR

The accompanying flowsheet shows the planned treatment of the Cananea ore, although the mill had not been operated when this article was written. Design of the plant was based on a number of things: lengthy laboratory work on drill cores from the orebody, churn-drill sludge, and ore from boundaries exposed underground; experience with the Morenci plant; and experience at other large copper concentrators. Important items of equipment are shown on the flowsheet.

Ore from the mill bin is fed to the ball mills by feeders that deliver a predetermined amount. The eight ball mills are similar to the 10x10-ft. Marcy grate mills used at Morenci, with only slight modification. The Morenci layout was altered, however, in placing the Akins classifiers alongside the ball mills in the manner shown in the plant layout. No auxiliary elevating devices are used in the grinding circuit.

At Morenci, the original flowsheet called for a primary and a secondary rougher flotation concentrate; the former to be cleaned, the latter to be reground before treatment in separate cleaner cells. At Cananea, note that the primary rougher concentrate goes to the middling thickeners and then to the regrind circuit without cleaning, and the secondary rougher concentrate is cleaned before going to the middling thickeners. The reground concentrates are then recleaned, the final concentrate going to the concentrate thickeners and the tailing back to the primary rougher. It is intended to keep the pH of the rougher and cleaner circuits at about 9 to 10, using lime, and the pH in the recleaner cells at about 12, or practically a saturated solution of lime. The aim here is to hit the remaining iron as hard as possible in the regrind and recleaner circuits, where the extremely high pH can be obtained with a minimum quantity of lime.

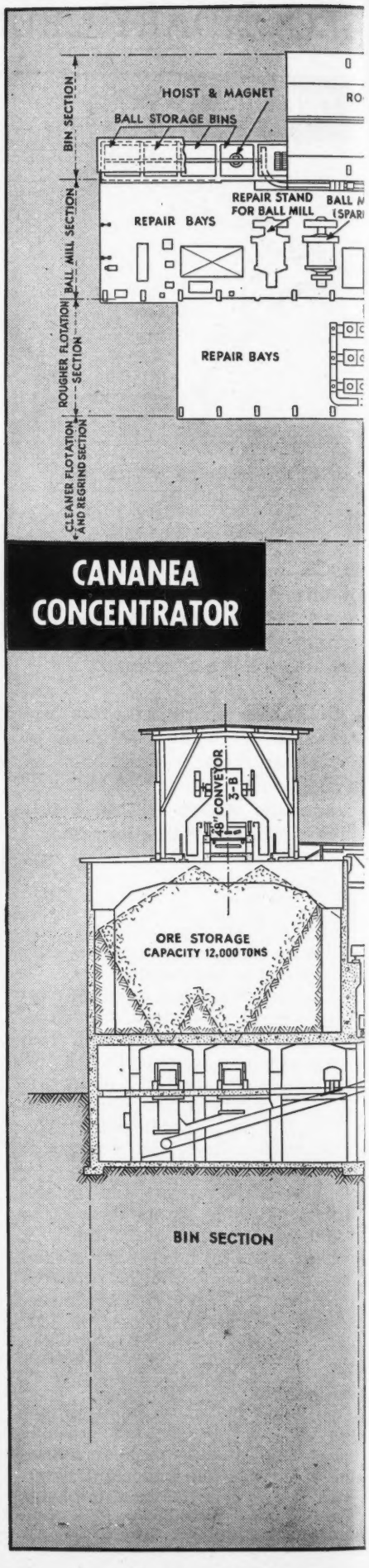
Lacking metallurgical data, comparison of the Cananea and Morenci flowsheets is largely conjectural, but it would be interesting to make certain deductions, to see how close one came to facts. For example, it appears that the Morenci flowsheet, where the primary concentrate is cleaned without regrinding, might involve less danger of sliming, and perhaps losing, some high-grade copper particles. On the other hand, the Morenci regrind circuit will obviously be loaded more heavily with a lower-grade product than will Cananea's regrind circuit, which means that more slimed gangue and middlings will be returned to the head of the Morenci circuit. Also, the Morenci operators may have to regulate their secondary roughers more closely than will the Cananea operators, where cleaner cells act as a buffer before the regrind circuit. Lastly, iron control would seem to be easier in the one, high-lime, regrind and recleaner circuit at Cananea than in the two cleaner circuits at Morenci, where probably the same latitude is not permissible in use of lime. Reagents used at Cananea will be as shown in the flowsheet to begin with, but tests with other reagents will be made and such changes as seem suitable will be adopted.

The disposal of tailing at Cananea is ingenious. From the two tailings thickeners, pulp at about 45 percent solids will flow about 2,500 ft. through 20-in. Transite pipe that discharges into a narrow canyon. Flow in this canyon has been streamlined somewhat by bulldozing and blasting, and a channel has been built down which the tailings will flow about 7 miles to what was the nearest suitable location for a tailings dam.

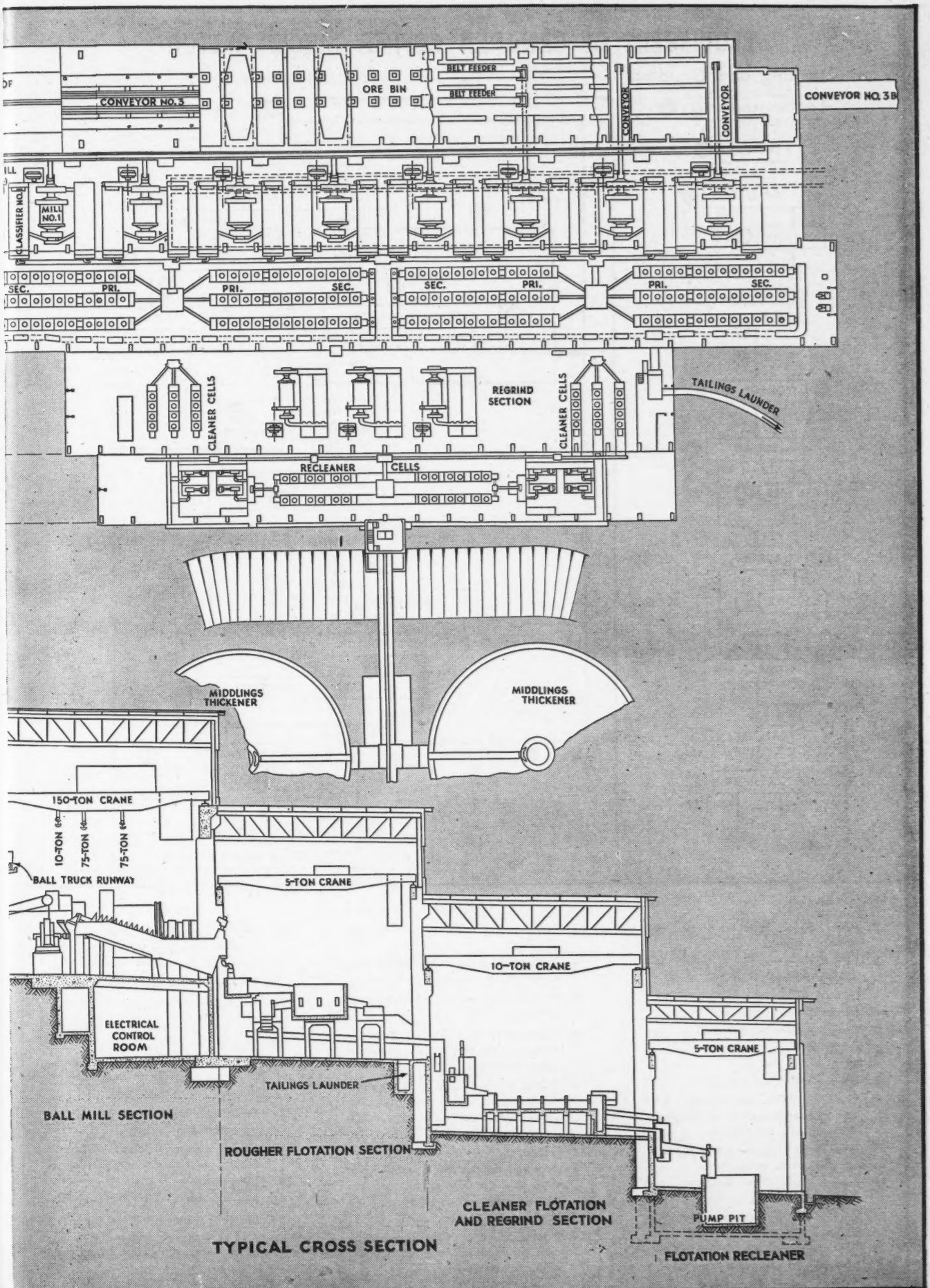
This is, however, no ordinary tailings dam, built up painfully inch by inch and demanding as much care and coddling as a month-old baby. The Cananea dam is a real dam, built of rolled earth over a concrete key wall and faced on both sides with semi-pervious gravel topped with heavy rock fill. The dam is 25 ft. thick at the top, 500 ft. thick at the bottom, 120 ft. high, and about 760 ft. long at the top on a radius of 636 ft. convex upstream. Capacity of the reservoir thus created is 435,000,000 cu.ft.

The beauty of this arrangement is that it requires no attention, and therefore involves no disposal cost. Furthermore, there is no danger of a cloudburst washing out overnight the labor of years (as sometimes happens to built-up tailings dams), for ample spillways have been provided around the Cananea dam.

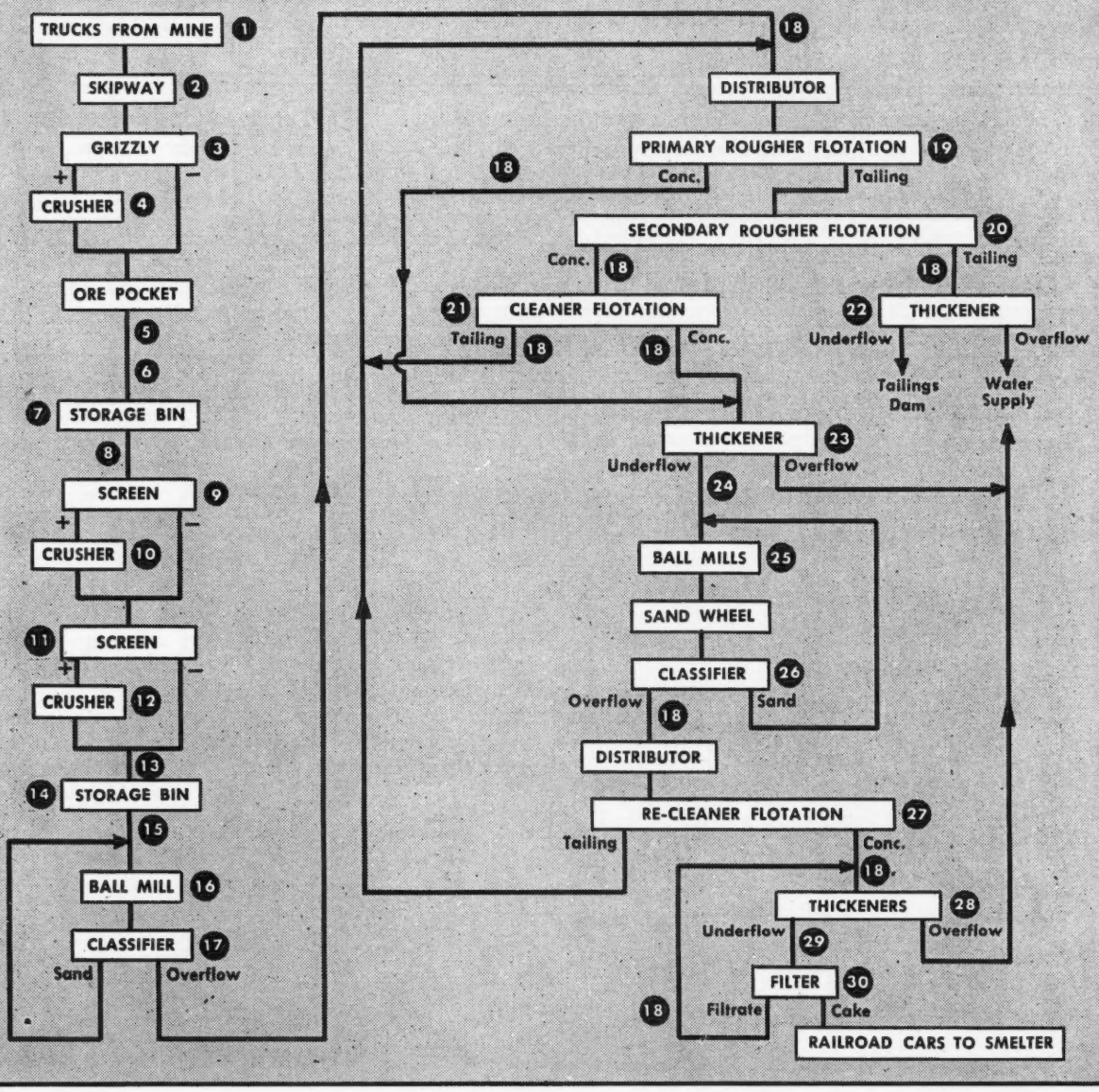
Water for the new concentrator



SIMPLICITY of design was objective in laying out Cananea's mill (right.) Note refinements like use of hoist and magnet to load ball car and segregation of pumps and electrical controls.


CONVEYOR NO. 3
ORE BIN
BELT FEEDER
BELT FEEDER
CONVEYOR
CONVEYOR
CONVEYOR NO. 3B
CLASSIFIER NO.1
MILL NO.1
SEC.
PRI.
PRI.
SEC.
SEC.
PRI.
PRI.
SEC.
CLEANER CELLS
REGRIND SECTION
CLEANER CELLS
TAILINGS LAUNDER
RECLEANER CELLS
MIDDLINGS THICKENER
MIDDLINGS THICKENER
150-TON CRANE
10-TON
75-TON
75-TON
BALL TRUCK RUNWAY
5-TON CRANE
10-TON CRANE
ELECTRICAL CONTROL ROOM
5-TON CRANE
TAILINGS LAUNDER
BALL MILL SECTION
ROUGHER FLOTATION SECTION
CLEANER FLOTATION AND REGRIND SECTION
PUMP PIT
FLOTATION RECLEANER
TYPICAL CROSS SECTION

FLOWSHEET OF CANANEA COPPER CONCENTRATOR



LEGEND

1. Macks, 30-ton, Waukesha-Hesselman 200-hp. engines.
2. Two 40-ton skips run in balance on 30-deg. slope.
3. Grizzly, 6-in. spacing.
4. Traylor 54-in. gyratory.
5. One Stephens-Adamson 60-in. pan feeder.
6. Belt conveyor, 48-in.
7. Storage bin, 8,000 tons.
8. Four S-A 48-in. pan feeders and 48-in. conveyor with Dings magnets and magnetic head pulley.
9. Tyler Ty-Rock screen 6 x 14 ft., 1-in. openings, rods across flow.
10. Symons cone, 7-ft. standard, plus one complete spare crusher.
11. Four Ty-Rock screens, 5 x 10 ft., ¾-in. openings, rods across flow.
12. Two Symons cones, 7-ft. short head, plus one complete spare crusher.
13. Two conveyors, 48-in., 550 ft. and 725 ft.
14. Concrete bin, capacity, 12,000 tons, 8 sections, 8 outlets in each section.
15. Merrick Feedoweight controllers on belts to ball mills.
16. Eight Marcy 10 x 10-ft. grate mills. Reagents here are: pine oil. Aerofloat 238, lime to pH of 9-10.
17. Sixteen Akins classifiers, 54-in.; overflow of each, 1,225 g.p.m. at 18% solids, 2% + 65 mesh, 70% — 200 mesh.
18. Geary-Jennings automatic samplers.
19. Double-discharge Fagergrens, 66-in. cells, arranged in two units, six banks of four cells in each. Six minutes total rougher contact time.
20. Double-discharge Fagergrens 66-in. cells, arranged in two units, six banks of eight cells in each.
21. Double-discharge Fagergrens, 56-in. cells, arranged in two units, three banks of four cells in each.
22. Two Dorr thickeners, 230 ft. diameter.
23. Two Dorr thickeners, 100 ft. Torq type.
24. Two diaphragm pumps and elevators.
25. Three Allis-Chalmers ball mills, 6 x 12 ft., overflow type. Reagents added are: lime to pH of 12, Aerofloat 238, pine oil.
26. Three Dorr rake classifiers, 12 x 28 ft., type QSF.
27. Double discharge Fagergrens, 56-in. cells, one unit of four banks of six cells each.
28. Two Dorr thickeners, 75-ft. Torq type.
29. Diaphragm pumps.
30. Two American disk filters, 8-ft. diameter, 6 leaves each. Dry vacuum pump.

comes from a series of 8 wells of an average depth of 650 ft. put down about 11 miles north of town. Three are 20 in. in diameter; 5 are 16-in. holes, and all are cased double with No. 8 casing, perforated from the bottom to within 50 ft. of the top. The capacity of each is estimated at 500 g.p.m., with one Pomona deep-well turbine pump at each well doing the work. Because water consumption of the new plant is estimated at 3,000 g.p.m., only 6 of these wells will be needed at one time.

The well pumps deliver to a storage tank at a central pumping station, from which four I-R Cameron 1,000-g.p.m. high-pressure pumps send water up to Cananea, 11 miles away and 1,100 ft. higher. The line is made of 16-in. spiral-welded pipe in 30-ft. lengths joined by Dresser couplings. The pumps at the central station are protected against water hammer by a Pelton Water Wheel Co. surge suppressor.

Up at the mill, water is stored in a 3,000,000-gal. reservoir 280x115x 18½ ft. in size, which was dug into the level ground behind the mill. Water is pumped from this reservoir up to a 100,000-gal. steady-head tank atop the mill ore bin, which supplies the various mill outlets. It is not intended to reclaim any water other than the overflow from the tailing, the middling, and the concentrate thickeners, which will be returned to the reservoir.

SMELTER AND POWER PLANT

Although the Cananea smelter is not a part of the new low-grade ore project, it is a highly interesting plant run in a most progressive manner and it deserves a much larger space than it can be given in this article.

The smelter can handle 650 to 700 tons daily of copper concentrate carrying 30 to 35 percent copper. Bedding yards are available for mixing flux, secondaries, and concentrates if necessary. The 4-C concentrate is charged directly without bedding. Two reverberatories, 22x 100 ft., are available, and they are charged twice each shift. The practice of wet smelting is still observed at Cananea, and excellent results are obtained with it. The concentrate from the old Cananea mill, which is now being smelted, carries 32 percent copper, 6 percent insoluble, and 8 percent moisture as it enters the reverberatory.

These furnaces are completely insulated with an 8-in. coating of a vermiculite preparation, which has the trade name Thermoflake. This permits a possible draft in the furnaces of 0.06 to 0.10 in., a suction that would draw far too much cold air into an uninsulated furnace. Operating draft is actually 0.03 in. In addition, the insulation lengthens arch life by cutting off leakage of air. Arch life is two years at least, in the Cananea furnaces, and some arches last four or five years.

The matte, containing about 38 percent copper, is treated in small Great Falls converters, which produce 50 tons each of copper per day. When the new mill reaches capacity, four of these converters will be kept hot, one will be a standby, and there will be one spare converter stand and shell. The blister copper cast at Cananea is shipped to Perth Amboy, N.J., for refining.

One of the most interesting phases of building the new plant was the expansion of the old power plant. New equipment was unobtainable, but usable second-hand boilers and a generator were finally found. A G.E. turbine generator was purchased from the Detroit Edison Co. and two B & W boilers were obtained from the West Pennsylvania Power Co.

The old Cananea power plant contains some of the finest steam-driven equipment still in operation anywhere, and it is kept in excellent condition. When one realizes that the new power plant was built in and around the old plant, fitting in with it wherever possible, and without shutting the old plant down, one is even more impressed. Waste-heat boilers are already in operation on the reverberatory furnace exhausts, and the "new" second-hand boilers will be fired with natural gas brought in from near El Paso.

CONSTRUCTION

The design and construction of the metallurgical plant, power plant, and water supply were under the direction of Wilbur Jurden and his staff, who previously have designed such outstanding plants as those of Andes Copper Mining Co., Potrerillos, Chile, the additions to Chile Exploration Co., Chuquicamata, Chile, and numerous other plants for Anaconda Copper Mining Co. Mr. Jurden and his staff also designed the new Morenci plant for the Phelps Dodge Corp.

Layout of the mine and the stripping operation were under the direction of A. E. Millar. Actual stripping and all construction work was contracted for by Compania Bechtel, S. A., whose staff had previously completed the Morenci and Castle Dome jobs successfully.

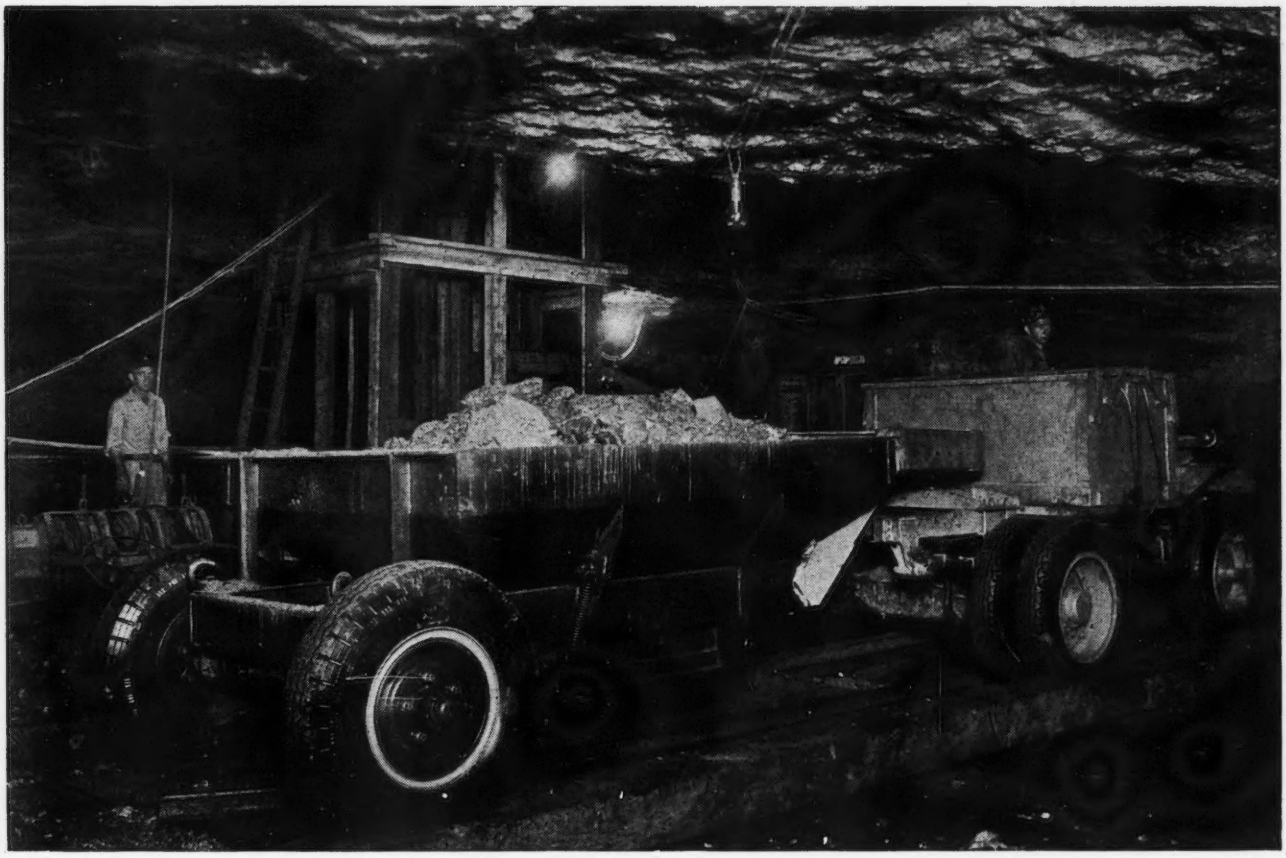
During the course of the contractor's work, the goal was to remove 900,000 tons of waste monthly from the pit, and to pour 5,000 cu.yd. of concrete per month. The most difficult of these marks to attain was that for concrete. Gravel suitable for aggregate is not plentiful in the region, and had to be trucked several miles. A central screening and mixing plant was set up and mixer trucks carried the concrete up the hill to wherever it was needed.

The hardest job of all, however, was the necessary training of the thousands of carpenters, electricians, drillers, cat skinners, concrete men, blasters, shovel runners, welders, and machinists that the job required. More than 4,000 men worked on the Cananea job at one time, and immigration rules held the number of foreign technicians down to 150.

CONCLUSION

That is the story of the Cananea Low-Grade Ore Project, so far as it may be told today. This magazine is not given to rash predictions, but I think we are risking nothing in forecasting that this mine will become one of the best-known and most highly regarded mines in the business. It was well founded, painstakingly planned, and soundly built; its management is composed of men who know, and like, their work; its workmen have an affection for the mine built through long association with its surroundings. If there is such a thing as a formula for success in mining, these are its principal elements.

In closing, I wish to express my sincere thanks for the friendly assistance given me by the following men, both in gathering the material and in the preparation of this article: Albert Mendelsohn, William Wraith, Jr., A. E. Millar, Guy H. Ruggles, W. A. Wasley, W. M. Healy, R. B. Mulchay, Wilbur Jurden, L. R. MacLeod, and A. P. Svenningsen, all of the Cananea Consolidated Copper Co., S. A., and L. J. Bares, of the Compania Bechtel, S. A.



"BLITZ BUGGY" consisting of storage-battery truck and bottom-dump trailer in use at Blue Goose No. 2 mine. This type is suitable for sheet-ground mines which permit large sweeping turns.

Rubber-Tired "Blitz Buggies" Haul Ore Underground

S. S. CLARKE, *General Superintendent of Mines, Eagle-Picher Mining & Smelting Co.*

TRUCK HAULAGE was first introduced in the Tri-State by the Eagle-Picher Mining & Smelting Co., at its Blue Goose No. 2 mine in September, 1941. This change from time-honored "cans" was heresy, but the economics of mining low-grade bodies made some radical departure in haulage methods necessary.

After some thought, it was decided to use storage-battery electric trucks rather than risk the hazard of exhaust gases from internal-combustion engines. Some used Walker electric trucks were purchased, and rebuilt to handle a bottom-dump trailer which was patterned after the large type used for hauling ore on the surface from outlying shafts to the Central mill. See illustration of truck and bottom-dump trailer ("blitz buggy") in service.

The trailer design was satisfactory in the sheet-ground mines because it permitted large sweeping turns into loading position. However, it was not satisfactory in the upper ore beds, where the runs were narrow and too much jockeying was necessary to get the trailer into proper loading position; this effort lost time and caused a serious drain on the battery.

A hopper-type body, mounted on the truck chassis, was then constructed in our shop. This type permitted making sharp curves and backing quickly into loading position if necessary.

Two sizes of trucks are in use: a large type having a capacity of 5 tons' dry weight, and a smaller having a capacity of 3.5 tons' dry weight. See photograph showing box-hopper-type dumping over grizzly.

The dump doors on both the trailer and the hopper type are not entirely satisfactory. Wear around the door frames is excessive, and before long the door and frame become buckled because of the impact of boulders. A new type of truck, intended to eliminate these objectionable fea-

tures by substituting an end-dump box, has been designed and built by Landis Steel Co., of Picher, Okla., and is being tried at the Netta mine. See illustration of end-dump type. The general opinion is that the maintenance on this type will be less. The first one built was a 7-ton trailer type which employed two 12-in. air cylinders to dump the body.

Two smaller bodies of this type are now being built to mount on the truck chassis. If this design proves more satisfactory than the box-hopper truck and bottom-dump trailer, they will be replaced with the newer design when worn out.

Roadway Maintenance

Roadways must be maintained to insure low truck maintenance cost. In two mines, mill tailings are transferred through churn-drill holes from the surface to underground hoppers, where the tailings are drawn off to fill holes or resurface the roadbed. A mule-drawn road grader is used to spread the tailings and maintain the roadway.

Truck haulage was installed at the Paxson mine after it was reopened in April, 1943. The equipment consists of four 5-ton trucks, tired with four 10:00x20, rock-grip, 14-ply tires; and powered with 44-cell, 21-plate batteries. Loads are dumped into a small skip pocket with 10-in. grizzly running lengthwise. A strong flow of water prevented sinking the shaft deep. The skip pocket was raised about 7 ft. above the mine floor, and is reached by a ramp about 80 ft. long and having an 8 percent grade. A spare battery is not carried in reserve. Batteries are charged at underground charging stations at the close of each shift. An equalizing charge is given all batteries once a week. Two 20-kw., 500-amp. charging units are in use. Charging time is controlled by a charge-control unit, which has proved satisfactory.

From the reopening of the mine until May 31, 1944, 267,420 tons were hauled by trucks. The average dry load was slightly under four tons. Assuming that the four trucks were in continuous operation (company records showing time out for truck or tire repairs are not complete), about 69,500 trips were made, covering approximately 11,000 miles. Two tires were replaced in May, and the rest of the rear wheel tires indicated a need for early replacement. The front tires appear to be good for about one-third more mileage.

The over-all height of the box-type truck is 6 ft. 8 in., and about 8 ft. 6 in. clearance is necessary to protect the driver. The height of the mine working face varies from 10 ft. to 18 ft. and averages about 14 ft.

Bodies for the Paxson fleet were built in the company shop. The dump doors are released by a pedal controlled from the driver's seat.

The tonnage handled the first four months of 1944 at the Paxson shaft was 96,560 tons, or a daily average of 937 tons. The trucks averaged 58 trips per shift (about 7¼ hr.) and hauled 234 tons. The average round trip is slightly in excess of 1,000 ft.

Hauling Schedule for Blue Goose No. 2 Mine

Place	*No. of Trucks*	*Trips*	*Tons*	*Total Distance*	*Time for Round Trip*
East End	1	47	170	1,320 ft.	8 min.
West End	1	42	150	1,500 ft.	9 min.
N.W. End	2	26*	235	2,800 ft.	15 min.
		29**			
Total		144	555		

* Large truck. ** Small truck.

Average Haulage Costs per Dry Ton

	Blue Goose No. 2	*Paxson*
Labor	$0.091	$0.066
Repairs and Supplies	0.053	0.027
Power	0.012	0.006
Insurance	0.001	0.006
Mules	0.001	0.001
Total	$0.158	$0.106

Haulage Labor Shifts per Day

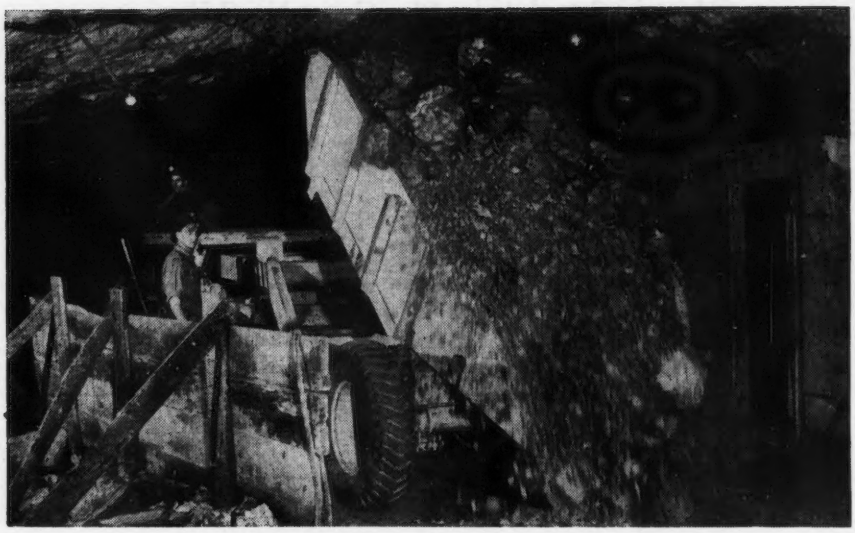
	Blue Goose No. 2	*Paxson*
Drivers	4	4
Welder	1	1
Maintenance	1½	2
	6½	7

TRUCK with box-hopper body dumping over grizzly. This type is more maneuverable than the bottom-dump trailer type.

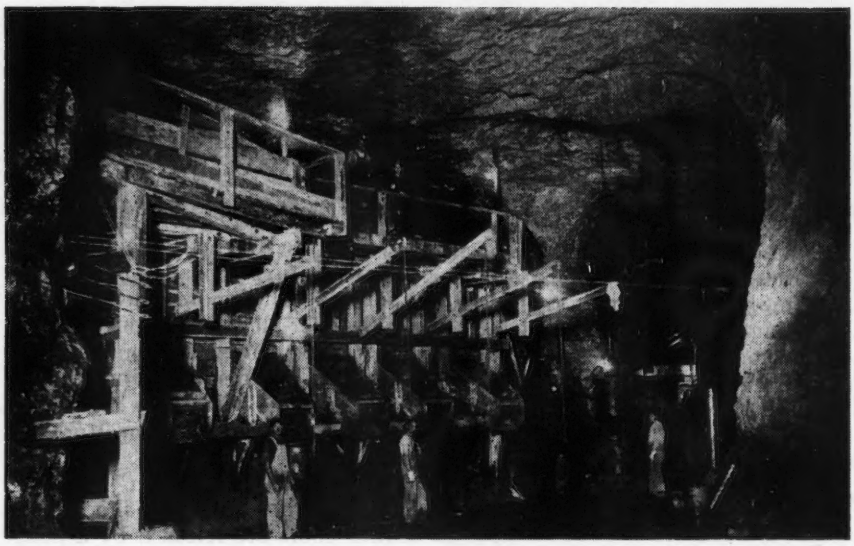
Loading Cycle

Thirty seconds is required to dump a load, 20 sec. to turn around, and about 60 sec. to return empty to the loading. Travel time to the shaft varies from 2 min. and 5 sec. to 4 min. Toward the end of the shift, when the heading is nearly cleaned up, it sometimes takes 8 min. to load up.

Trucks were installed in the Blue Goose No. 2 mine in September, 1941. Up to June, 1944, they had transported about 445,000 tons. These trucks are of the trailer type



NETTA MINE employs end-dump trailer type, which eliminates discharge door and frame. Body is raised by 12-in. air cyinders.



TRUCKS ascend ramp to dump ore into loading hopper at Netta mine. Ore is transferred to cans and hoisted at nearby shaft.

with bottom-drop door, and dump into a skip pocket.

Two sizes of trucks, rated by the factory at 2.5 and 5 tons, are in use. The trailers are of two sizes, the larger having a capacity of 5 tons and the smaller holding 3.6 tons. The larger trucks are equipped with 44-cell, 21-plate, 500-amp.-hr. batteries, and the smaller trucks use 44-cell, 23-plate, 374-amp.-hr. batteries. Batteries last 8 hr., and at the end of each shift retain a fair reserve of power.

Trailers are equipped with 9:00x18 tires; tractors with 7:50x20 duals, or 10:00x20 singles.

The accompanying tables compare costs and labor requirements at the Blue Goose No. 2 and Paxson mines.

Inspection, servicing of trucks, and minor adjustments require about 40 min. per day per truck. Thirty minutes is necessary for a tire change. Rear springs require 2½ hr. and front springs one hour, for a change-out.

Trucks are in use at the Netta and Leopard mines. Owing to the limited time allotted to bring these mines into production, it was impossible to install skip-hoisting equipment and to cut skip pockets. A large wooden hopper was built close to the hoisting shaft. See illustration. An incline ramp with about 10 percent grade led to the top of the hopper. At the start, a small hoist was installed at the top of the hopper to assist the trucks in making the grade if batteries became weak toward the end of the shift. However, battery capacity has been sufficient for the trucks to operate the full shift without assistance. The ore is drawn from the hopper into cans and hoisted to the surface.

Operating Time

At the Netta mine, where one of the new type bodies is used on a round-trip haul of one and one-quarter miles, the time required for various operations is as follows: loading, 5 min.; dumping, 1 min.; travel time, 7½ min.; return empty, 7 min.; turn around and jockey for loading position, 2½ min.; total time, 23 min. About 18 trips are made per day.

For the hopper-body type truck, which holds from 3 to 3.5 dry tons, the loading time is 3 min.; dumping time, 2 min.; and total time for a 1½-mile round trip is 14 min.

The tractor of the 7-ton unit is equipped with 10:50 x 20 tires, and the trailer with 12:00 x 20 size. Dual 8:25 x 20 tires are used on the 3-ton trucks. Tire life is estimated at 14 months at this mine.

Haulage costs at the Netta mine are higher than at the other mines, as they include the labor of hopper pullers (men who load the cans and push them to the shaft). The crew consists of 4 truck drivers, 3 hopper pullers, 1 welder, 2 maintenance men. Haulage costs are shown in the accompanying table.

Haulage Data for Netta Mine

(Costs shown per rock-ton)

	Year 1943	*To June 1944*
	Short Haul	Long Haul
Tons hauled	132,721	38,820
Average daily tonnage	430	330
Labor	$0.188*	$0.243**
Repairs and supplies	0.061	0.093***
Power	0.013	0.014
Insurance	0.002	0.002
Mules	0.001	
Total	$0.265	$0.352

* $0.07 increase due to hopper puller. ** Low tonnage and new construction.
*** New truck.

Let's Look at Mercury

W. M. STIEH, *President, Metalsalts Corporation*

Mr. Stieh's chief interest in the metal is as a consumer. He is concerned about obtaining adequate supplies at a reasonably stable and economically sound price level. Wide price swings, he holds, usually prove harmful to producers and consumers.

WHAT IS the future of mercury? What substitutes will be adopted? Will the American mines be forced out of business? Will the Mercurio Europeo cartel control the world market? Will the price be dominated by London? What will Canada, Mexico, do? What will the government do with its stockpiles? Will we see $40 per flask metal? Will we have a free international market in mercury? These are just a few of the many questions puzzling the consumers. Frankly, we do not have all the answers. No one has, but some light can be shed to show which way the wind is blowing.

Although the production and consumption of mercury are relatively small in comparison with the corresponding figures for other metals, numerous uses of the metal and its romantic history make interesting reading. Frequently, to satisfy the demand for information, articles are published, not so much dealing with the facts, but rather distorted because of the limited information available to the writers. This is particularly true with respect to the wartime use of mercury. One of the erroneous impressions is in regard to its importance as a detonator for shells. By comparison, its use as an active prophylactic agent exceeds that in fulminate as well as in the production of pyrotechnics. The use of mercury has had a spectacular rise as a catalyst for war material, and this use may greatly expand in the postwar period in other fields. Many new uses for mercurials have been adopted during the emergency that will, to a large degree, provide increased consumption in the postwar period. This is particularly true in the electrical field. Organic mercury compounds have had a general acceptance, as in the mildew-proofing of fabrics and leather, slime control for the pulp and paper industry, and wood preservatives.

HOW ABOUT SUBSTITUTES? History shows that each time a material has been substituted for mercury, a new use has been found. In the pharmaceutical field, calomel at one time was the "cure-all" for liver ailments. This use during the last twenty years has become practically non-existant, but the use of mercurials as a prophylactic agent, especially in the war period, has more than offset this loss. Large quantities were formerly used for the preservation of wood, as in railroad ties and telegraph poles. Business in this field dwindled, but the treatment of seeds more than replaced losses sustained in wood-treating. It is logical to assume that this trend will continue.

WILL AMERICAN MINES BE FORCED DOWN? This is a broad question touched on elsewhere in this summary. The important point is that the United States should and must preserve its resources for military purposes and for price protection in peace. At present wage levels and the exhaustion of high-grade ore, a price of $70 or less would close down all but one or two producers.

WILL MERCURIO EUROPEO CONTROL? The present line of thought in Washington strongly opposes cartelization of industry. Cartels in certain instances have been beneficial when properly handled, but, in the main, the public pays higher prices. It is likely that some government import restrictions will be imposed on commodities that are controlled by foreign cartels, to prevent dumping from destroying domestic production. Cartels will operate in the postwar period, call it what you like—production control—price regulation—import-export control, under private or government operation. Some cartels offer impressive cases to justify their actions. We do not wish to elaborate on this subject, but merely point out that Mercurio Europeo has had a price range of $40 to $250 per flask, the latter figure taking full advantage of a period of emergency that was only forestalled by the excellent production record of the American mines. The cartel's price at this writing, to the best of our knowledge, is still $250; while the New York price today is near $118. About ten years ago the American producers were suffering from $40 New York cartel metal. Alternate dumping and high prices whipsawed United States producers and consumers.

WILL LONDON DOMINATE THE PRICE? It hasn't since the House of Rothschild in the late 20's discontinued handling mercury. London is not expected to come into the picture save as agent of the cartel.

WHAT WILL CANADA DO? Canada, a new producing country, was a factor in the market during the war emergency. Production increased to about 50 percent of the domestic output, and there is a possibility that Canada may go a long way toward satisfying Empire demands and may not become a factor in the United States market.

AND MEXICO? For ten years preceding the current World War, Mexico produced about 6,000 flasks of mercury annually, and doubt exists on whether this figure will expand in the postwar period. Production is insufficient and costs are too high to influence the world mar-

ket. Most of Mexico's production may move into the United States.

THAT GOVERNMENT STOCKPILE? The existing stockpile now held by the government represents approximately two years' supply based on our peak production during the current World War. In an article by the author,[1] it was advocated that one measure of military security could be obtained by increasing this stockpile to a four-year supply, or approximately 200,000 flasks. Mercury lends itself to long-time storage. Current thinking points to "freezing" stockpiles, but this hardly disposes of the matter. The difference between the present stockpile and the quantity suggested could be a medium of keeping American mines "in operating condition" and giving control over dumping.

WILL WE SEE $40 METAL? The price of $40, New York, is not far above the record low for the last 50 years. With the present duty, it is doubtful if the market will again recede to this level. The average price for mercury during the ten years preceding September, 1939, was $91, and this includes the depression of the 30's. Purely on a statistical basis and possible increase in peace-time uses of mercury, it is a fair guess to say that an average price will be somewhere near this ten-year average, with supply and demand governing price movements.

HOW ABOUT A FREE INTERNATIONAL MARKET? At present it is rather doubtful that all tariff barriers will be removed. Mercury is obtained from relatively few countries, with Spain the largest producer. Spain, not being a manufacturing country, will continue to export metal, as before the war. The United States is a producer as well as a manufacturer of mercury, and a double tariff, protecting both production of the metal and mercury products, is required. A market freed of all trade barriers is not likely to prevail after the war.

LOOKING AHEAD. Spain and Italy will continue to lead the world in production of mercury. World consumption will average between 101,000 and 125,000 flasks a year. The United States will resume imports. Price range after the war will fluctuate between $75 and $95 (coastal shipping will automatically reduce the present price in New York by approximately $3). The tariff will remain at its present level. The government will retain the major portion of its stockpile, without any dumping, and will take action to prevent exorbitantly high or distressingly low prices. Consumption in the United States will continue at 20,000 to 30,000 flasks a year. Substitution will be offset by new uses. Canadian production in the main will go to the United Kingdom. Mexican metal will be consumed here or in South America. International cartels will continue, probably under government regulation.

[1] American Metal Market, Mar. 17, 1944.

Fast Work Retimbering Burned-Out Shaft

WHEN FIRE DESTROYED the timbering in the 750-ft. Mohawk shaft of Mammoth-St. Anthony, Ltd., at Tiger, Ariz., as well as the greater part of the surface plant, on Sept. 4 last, all production stopped. It was important to resume operations as soon as possible and rapid repair of the damage suffered was imperative. The key to the problem was in the Mohawk shaft, for production could not be resumed until the burned-out timber had been replaced and hoisting facilities restored.

The timbers were completely burned from surface down to the bottom, or 750-ft., level. The fire had destroyed the electric cables running to the mine pumps, so the first task was to enter the mine through the undamaged Mammoth shaft 1,500 ft. away, brattice off the fire, restore ventilation, and get the pumps running. Great care was necessary because of the danger of carbon monoxide, and breathing apparatus was used until conditions were safe. By mid-September the pumps were running, and adequate adobe brattices had been built at the stations in the shaft. For 150 ft. up from the bottom, the shaft was choked with burned and twisted pipe lines, pocket rails and liners, partially burned timber, and muck. The entire mass was smouldering, and in effect was an immense charcoal brazier 150 ft. deep and with a 750-ft. draft.

The management feared that this mass would burst into flames when pumping had lowered the water level to the point where the water seal would be broken, allowing oxygen to reach the bottom of the smouldering embers. Resumption of pumping was necessary, however, to provide domestic water for the 1,400 residents of the camp. The question of safety in retimbering the shaft was of great importance, and was given first consideration in making the plans for rehabilitation. While retimbering can be done from a stage hung from hanging rods, it is dangerous, and only expert shaft men can work to advantage under such conditions.

Refusing to endanger lives by adopting such a plan, John A. Richards, general manager, evolved the idea of filling the shaft with tailing sand. This was done and it accomplished four major purposes: (1) the embers were smothered; (2) safety while retimbering was assured; (3) the shaft walls were stabilized; and (4) it was now possible to resume pumping and the water table was kept below the bottom level.

The shaft was filled with sand in four days by working all available men and trucks on three shifts. When the top of the sand reached a point 15 ft. from the surface, a concrete collar set was installed, and the next morning men were sent down the Mammoth shaft to draw off the sand at the 300 level. The sand had to be loaded by hand, inasmuch as all compressors had been destroyed by the fire and no air was available for mechanical loaders. Although it was thought at first that the sand might hang up and not draw successfully, this fear proved groundless. As the sand was removed at the various levels it was disposed of in old stopes as fill, and in some instances was stacked in old drifts. It was drawn off as fast as retimbering progressed, and the top of it was kept 15 to 20 ft. below the new timbers. The shaft crew worked at all times on a safety swing-staging.

The program was carried out successfully, and the shaft was retimbered for a distance of 700 ft. in 40 working days. This included the timbering in the stations at 100-ft. intervals, and the slow, laborious task of removing twisted pipes, rail, and plates from the sump area. It also included the time required for building a new steel headframe. Maximum progress achieved in retimbering was 100 ft. in three 24 hr. days, including the placing of lagging and guides and manway lining.

Bureau Seeks Strontium From Domestic Ores

M. M. FINE, *Associate Metallurgist, and* **R. G. O'MEARA,** *Senior Metallurgist, U.S. Bureau of Mines, Rolla, Mo.*[1]

OWING to the strategic importance of strontium minerals, domestic production and imports have been increased since 1940. Of the 3,172 tons imported during the first nine months of 1941, United Kingdom supplied 2,753 tons and Mexico the remainder. In view of the possibility that foreign producers may find it increasingly difficult to supply unbeneficiated celestite of chemical grade (90 to 92 percent strontium sulphate), it is estimated that part of the future needs will be supplied by concentrating low-grade domestic materials.

Texas Deposits

Low-grade celestite deposits of Brown, Nolan, Fisher, and Coke counties, Tex., are a possible source, and have been explored by the Bureau of Mines. The Brown County deposits are about 7 miles east of Brownwood, and occur as replacements in limestone under shallow cover. Although most of the celestite is coarsely granular, some of both fine-grained and crystalline aggregates occur intermixed with the granular deposits. Clay inclusions occur in granular varieties. Calcite is also a major impurity.

The Nolan County area includes deposits in Nolan, Coke, and Fisher counties. The largest deposits are in Nolan County about 5 miles southwest of Sweetwater. The celestite zone consists of soft sand and sandstones, shale, and thin beds of dolomite and dolomitic limestone. Celestite occurs chiefly as a coarse-grained replacement in carbonates and is often banded.

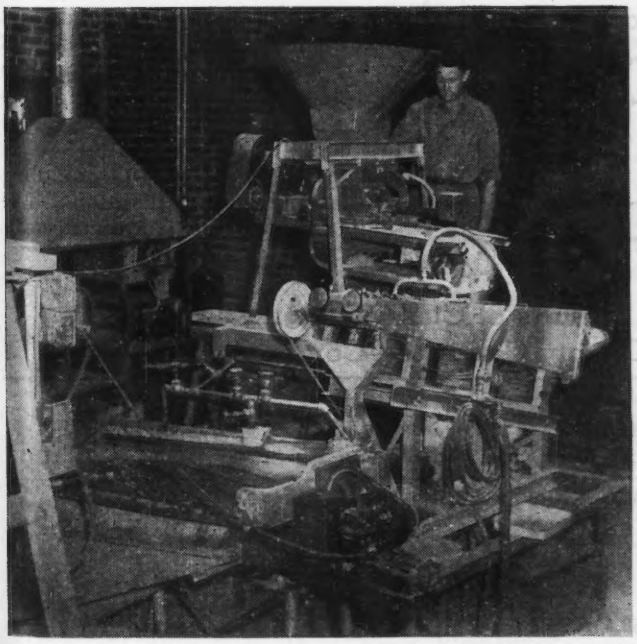
Exploration of the region has indicated a potential reserve of 271,000 tons of rock having an indicated average grade of 73 percent strontium sulphate. Nearly all of this reserve is in Brown County.

At present two operators are mining the deposits. The celestite is mined selectively, hand sorted to produce a fairly high-grade material, most of which is used for oil-well drilling mud. Until recently, substantial tonnages have been shipped to the Foote Mineral Co., in Pennsylvania, where gravity methods were employed to beneficiate the ore. Lately, it has been reported that the gravity methods have been unsatisfactory; consequently the purchase of Texas ores has been discontinued.

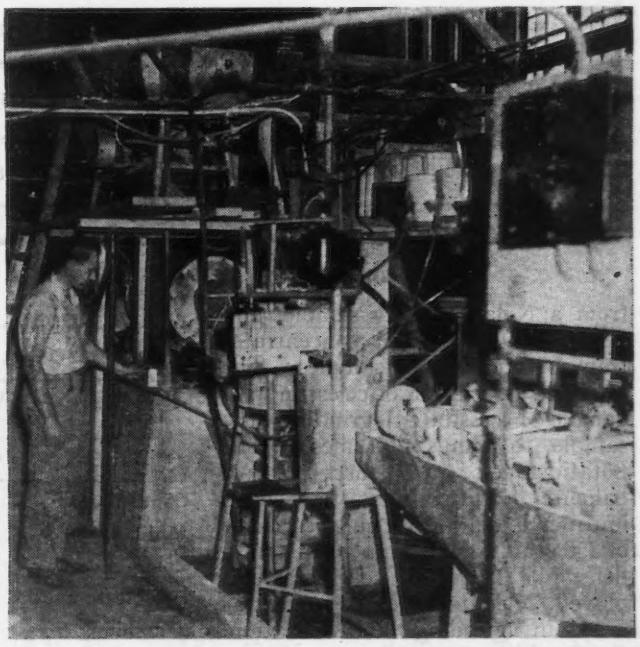
Therefore the Bureau of Mines undertook a mineral-dressing investigation of Brown and Nolan County ores in an attempt to produce concentrates containing 90 to 92 percent strontium sulphate.

Preliminary flotation tests produced a 95.8 percent concentrate

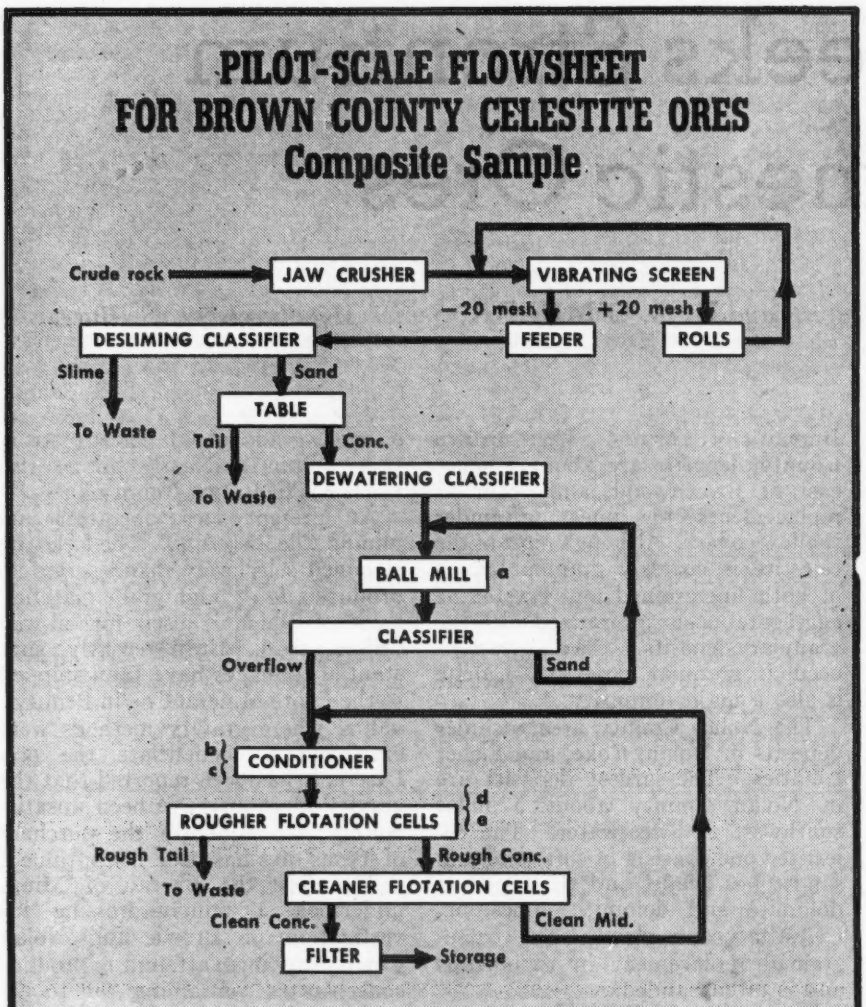
[1] Published by permission of the Director, Bureau of Mines, U.S. Department of Interior.



FEEDER in background delivers celestite ore to spiral classifier, where pulp is deslimed preparatory to its concentration on table in left foreground.



PORTION of pilot mill which concentrated composite sample of celestite ores. Grinding circuit shown in background. Note constant-head reagent feeders.



from a Nolan County sample, and 92.2 and 95.3 percent concentrates from Brown County samples. The intimate association of celestite with gangue necessitated grinding the sample to minus 200 mesh. The flotation cell was constructed of bakelite, with stainless-steel shaft, impeller, and grid. It had a capacity of 250 grams of dry pulp when a pulp density of 25 percent solids was employed. Zeolite-softened water was used in grinding and flotation. Quebracho was employed as a depressant for siliceous and carbonate gangue, with oleic acid employed as an effective collector for the celestite. Reagent K-480 with oleic acid also produced satisfactory results.

A composite sample was then made of representative ores from five properties in Brown County. The samples were broken from the celestite ledge in the pit face where overburden ranged from 2 to 8 ft. Rich spots in the ledge were avoided, so that the sample would be representative of medium- to lower-grade materials.

The composite sample contained increased quantities of carbonate gangue, clay, and barite. Much of the celestite remained locked with gangue even after grinding to minus 200 mesh. Chemical analysis of the sample in percent was as follows: $SrSO_4$, 59.7; $BaSO_4$, 3.2; $CaCO_3$, 16.1; SiO_2, 11.1; Co_2, 9.5.

Trial flotation tests of the sample, using reagent combinations similar to those employed on preliminary samples, were not successful, due to clay contained in the sample. Although flotation took place, it was non-selective in regard to celestite and the carbonate gangue. Prior beneficiation was therefore necessary to provide a satisfactory flotation feed.

Preparation of Sample

The following procedure was employed: A representative portion of the sample was crushed to minus 20 mesh, deslimed, and classified in a constriction-plate hydraulic classifier. Coarse classified products were tabled to make concentrates, middlings, and tailings. The middlings were combined, crushed to minus 48 mesh, and retabled with the fine classified products. Table I gives the results of classification and tabling.

Table concentrate and middling were combined for flotation. The sample responded to flotation accord-

Table I. Results of Classification and Tabling Brown County Celestite—Composite Sample

Product	Weight, Per-Cent	Analysis, Percent				Percent of Total			
		$SrSO_4$	$BaSO_4$	SiO_2	CO_2	$SrSO_4$	$BaSO_4$	SiO_2	CO_2
Concentrate	51.6	87.9	4.8	3.7	1.3	76.0	74.4	18.6	7.0
Middling	6.8	74.2	4.0	12.2	3.0	8.5	8.1	8.1	2.1
Combined concentrate and middling	58.4	86.3	4.7	4.7	1.5	84.5	82.5	26.7	9.1
Tailing	17.6	21.8	1.0	16.3	24.3	6.5	5.1	27.7	44.9
Slime	24.0	22.4	1.7	19.5	18.3	9.0	12.4	45.6	46.0
Feed (calculated)	100.0	59.6	3.3	10.3	9.5	100.0	100.0	100.0	100.0

ing to the scheme previously developed, with some variation in reagent combination. The use of quebracho plus copper sulphate was found to be more effective in depressing carbonate gangue than the quebracho alone, although the exact function of the copper sulphate was not determined. Possibly, a copper tannate was produced which was more effective than the tannin of the quebracho.

A recovery of 73.8 percent of the celestite in the feed, or 62.4 percent of the total, was made in a flotation concentrate containing 91.5 percent strontium sulphate, 5.0 percent barium sulphate, 0.7 percent silica, and 0.53 percent carbon dioxide. The grade of concentrate was not as high as that produced from the other samples, principally because of the presence of additional barite. The barite was as readily floatable as the celestite.

Pilot-Scale Test 1

A continuous pilot-scale confirmation of the laboratory results was then made, using the Brown County composite sample. It was thought that the results of such as investigation could be applied to most of the celestite bodies in Texas.

So far as possible, conditions of the laboratory tests were duplicated in the pilot plant. The 5-ton sample was crushed in a jaw crusher and rolls to minus 20 mesh and then mixed. The crushed material was fed at the rate of 60 lb. an hour to a double-screw spiral classifier, where water was added and the pulp was deslimed. Each spiral was 5.5 in. in diameter and 64 in. in length and was operated at 13 r.p.m. The deslimed sand went without further classification to a No. 15 Deister laboratory table, where some calcite and silica were removed. Available facilities did not permit classifying the table feed. The table concentrate was dewatered in an 8-in. spiral classifier 36 in. long, operated at 3 r.p.m. See photograph of the feeder, desliming classifier, table, and dewatering classifier.

The dewatered table concentrate went to a 19 x 36-in. ball mill loaded with 275 lb. of 2- to 3-in. pebbles. The ball-mill speed was 30 r.p.m. Soda ash and zeolite-softened water were introduced with the feed at the head of the mill. The pulp consistency in the mill was maintained at 41 percent solids. The ball mill discharge was classified in a 12-in. Akins classifier, 60 in. long, operated at 20 r.p.m. Classifier overflow had a pulp density of 22 to 24 percent solids, which provided a flotation feed about 95 percent minus 200 mesh. Overflow from the classifier was laundered to the conditioners, where quebracho and copper sulphate were added in that order.

Reagent feeders were of the constant-head siphon type. The conditioned pulp was floated in two six-cell banks of Denver No. 5 laboratory cells. One bank was used for roughing and the other for cleaning. Oleic acid and other collecting agents were added to the pulp entering the rougher cells. No additional reagents were necessary in the cleaner cells. The middling from the cleaner bank was pumped back to the conditioners and re-circulated. See illustration of ball mill, classifier, conditioners, reagent feeders, and rougher flotation cells.

Table II details the results of the first pilot-plant test. A concentrate containing 92.5 percent strontium sulphate, 5.2 percent barium sulphate, 0.5 percent silica, and 0.79 percent carbon dioxide was produced, with a recovery of 56.9 percent of the celestite. This recovery was less than in the batch test, but the grade of concentrate was higher.

Pilot-Scale Test 2

To increase the recovery of celestite, the use of auxiliary frothers with some collecting power was investigated. The two reagents used were the organic sulphates K-480 and X-1, both products of the Emulsol Corporation, Chicago, Ill. Such frothers permitted increased flotation and gave a lighter, less-flocculated froth. In most cases results equaled or exceeded those obtained with the oleic acid alone.

The results obtained with the two frothers were substantially the same. Table III details the results of a second test in which reagent K-480 was used. A recovery of 66.5 percent of the celestite was effected in a concentrate containing 93.5 percent strontium sulphate, 4.5 percent barium sulphate, 0.3 percent silica, and 0.82 percent carbon dioxide. This represented the best grade and recovery obtained on the sample.

In a commercial operation, loss of celestite in the slime would probably be in the same proportion as the loss in these tests. The strontium lost in the table tailing could be reduced if the feed to the table were classified. It would also be beneficial if facilities permitted the re-treatment of table middling, with or without regrinding. Most of the celestite in the flotation tailing consists of grains locked with the calcite. Petrographic examination of flotation tailing showed calcite inclusions in the celestite ranging in size from 4 to 50 microns; hence any additional recovery of celestite from the flotation tailing would be at the expense of concentrate grade.

Table II. Results of Pilot-Scale Test I, Brown County Celestite—Composite Sample

Product	Weight, Percent	Analytical Data: Analysis, Percent $SrSO_4$	$BaSO_4$	SiO_2	CO_2	Percent of Total $SrSO_4$	$BaSO_4$	SiO_2	CO_2
Flotation concentrate	37.3	92.5	5.2	0.5	0.79	56.9	55.4	2.3	3.2
Flotation tailing	25.1	66.5	3.9	10.4	6.68	27.5	28.0	32.3	18.4
Table tailing	14.3	38.9	1.1	16.4	22.38	9.2	4.6	29.0	35.1
Slime	23.3	16.7	1.8	12.6	16.89	6.4	12.0	36.4	43.3
Feed (calculated)	100.0	60.6	3.5	8.1	9.11	100.0	100.0	100.0	100.0
Feed (analyzed)	.....	60.7	3.1	8.2	9.32	.....	.....	....	....

Table III. Results of Pilot-Scale Test 2, Brown County Celestite—Composite Sample

Product	Weight, Percent	Analytical Data: Analysis, Percent $SrSO_4$	SiO_2	CO_2	$BaSO_4$	Percent of Total $SrSO_4$	SiO_2	CO_2
Flotation concentrate	42.9	93.5	0.3	0.82	4.5	66.5	1.1	3.4
Flotation tailing	15.9	56.7	16.6	9.64	...	14.9	22.1	14.7
Table tailing	19.9	30.7	15.9	23.90	...	10.1	26.4	45.7
Slime.....	21.3	24.0	28.3	17.68	...	8.5	50.4	36.2
Feed (calculated)	100.0	60.4	12.0	10.41	...	100.0	100.0	100.0
Feed (analyzed)	.....	58.7	12.0	10.26	2.7	.....	.....	.....

Flin Flon Shatter Cut Speeds Up Drifting

HAROLD KRAMER, *Mine Eng., Hudson Bay Mining & Smelting Co., Ltd., Flin Flon, Manitoba.*

EACH YEAR at the Flin Flon mine it is necessary to drive from 20,000 ft. to 30,000 ft. of sublevel drifts. In driving this footage, ground of every physical characteristic is encountered. Experiments have been conducted periodically to determine the most efficient method of drilling and blasting in all types of rock. Prior to 1937 either the diamond or the draw cut was used. After a series of exhaustive tests conducted from June to November, 1937, it was determined that a shatter cut was the most efficient to employ in medium to hard sulphide ore. The shatter cut was adopted as the standard and has been used since.

The tests completed in 1937 indicated the feasibility of drilling and breaking rounds up to 9 ft. in length. However, both drilling and mucking time were not sufficient to permit rounds of this length to be completed in an 8-hr. shift. In 1940 improved rock-drilling machines incorporating automatic feed were purchased, and the bottleneck became muck removal. In 1942 a Gardner-Denver car loader was procured. Experimental work showed that an increased advance of 2 to 3 ft. per day could be obtained using the standard "burn" cut. However, some difficulty in breaking the last half foot of the round was encountered. At the suggestion of the mine foreman, a shatter cut similar to that described as the "victory" cut, by T. M. Waterland, C. I. M. M. Bulletin, Nov. 1942, was used. This cut proved to be an improvement on the standard cut. The miner employed on the experimental work added two more holes to this cut, with the desired result.

The accompanying diagram of this round has been blue-printed for miners driving in sulphide ore.

The procedure used in drilling this round as described by Joseph Funk, the miner employed on this experimental work, is as follows: 1. Preparation. 2. Setting up. 3. Drilling. 4. Tearing down. 5. Blasting.

1. Preparation, assuming drift is free of gas or fog:

(a) Scale drift, especially last round.

(b) Muck back if necessary, wash face off with hose, and inspect it for missed holes.

2. Setting Up:

(a) Take center line and grade line.

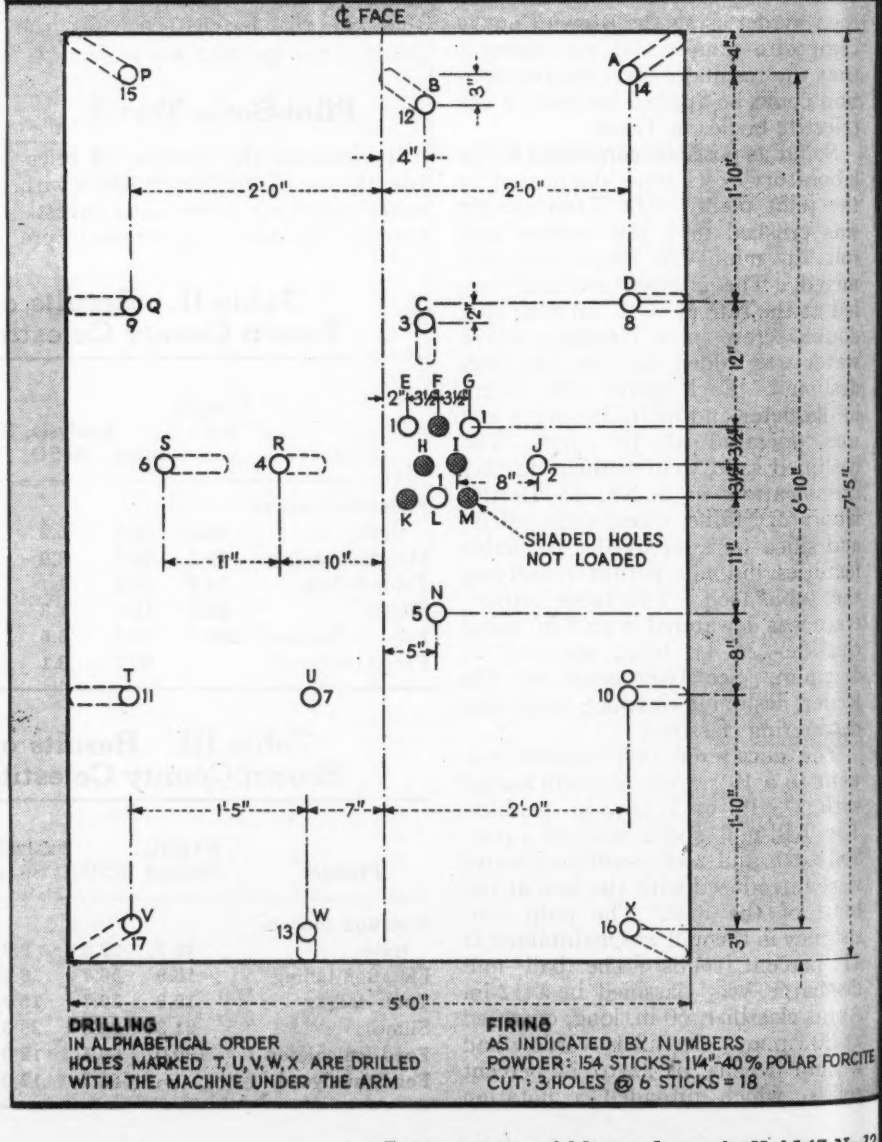
(b) Level the bottom of the drift for block which fits under bar

(c) Bring in bar, blocks, wedges to face.

(d) Set bar on block (2x6x18 in.) 3 ft. from center line and place another block on top of bar (of a size to fit the drift back closely).

(e) Wedge bar tightly by driving wedges between back and top block.

(f) Jack bar with screw jack on bottom of bar (helper).


℄ FACE
SHADED HOLES NOT LOADED
5'-0"
DRILLING
IN ALPHABETICAL ORDER
HOLES MARKED T, U, V, W, X ARE DRILLED WITH THE MACHINE UNDER THE ARM
FIRING
AS INDICATED BY NUMBERS
POWDER: 154 STICKS - 1¼"-40% POLAR FORCITE
CUT: 3 HOLES @ 6 STICKS = 18

(g) Bring in rest of rigging and install on bar.

(h) Bring up hoses and blow. Connect to machine. Fill lubricator and oil chamber in machine. Turn on air and water.

(i) Bring up shanks and bits (3 changes of shanks for 8-ft. holes).

3. Drilling the Round:

(a) Order of drilling the holes is shown on the drawing. This is not to be confused with the firing order, which is also shown. As will be noted, the holes on the right side of the bar are first drilled, with the exception of the lifter, No. 24. The holes on the left side are then drilled, likewise from the top down, the three lifters being left until last.

(b) All holes are drilled 8 ft. long using 8-ft. 6-in. steel, with $\frac{1}{16}$-in. gage decrease on each change.

(c) Never drill in or near a bootleg. There may be a film of powder in it, invisible to the naked eye, which will be enough to blind, or even to kill, the miner or helper.

4. Tearing Down:

(a) Close water and disconnect hose.

(b) Blow water out of machine, turn off air and disconnect hose from drill.

(c) Remove drill and arm from bar and jack bar down and take out wedges and blocks.

(d) Carry all equipment back far enough from face so that blast will not injure equipment. Stack on side of drift out of mucker's way.

(e) Build dam of muck about 6 ft. from face and bail out water at face to far side of dam.

(f) Blow all water and muck from holes with compressed air through a blowpipe.

(g) Remove air hose and blowpipe to place of safety from blast.

5. Blasting Round:

(a) Bring in powder, fuse, and spacers to face (also tamping). Never smoke while handling powder and primers or have open lights near.

(b) Split powder and make up primers. Tamp powder firmly but gently into holes. Do not handle powder roughly.

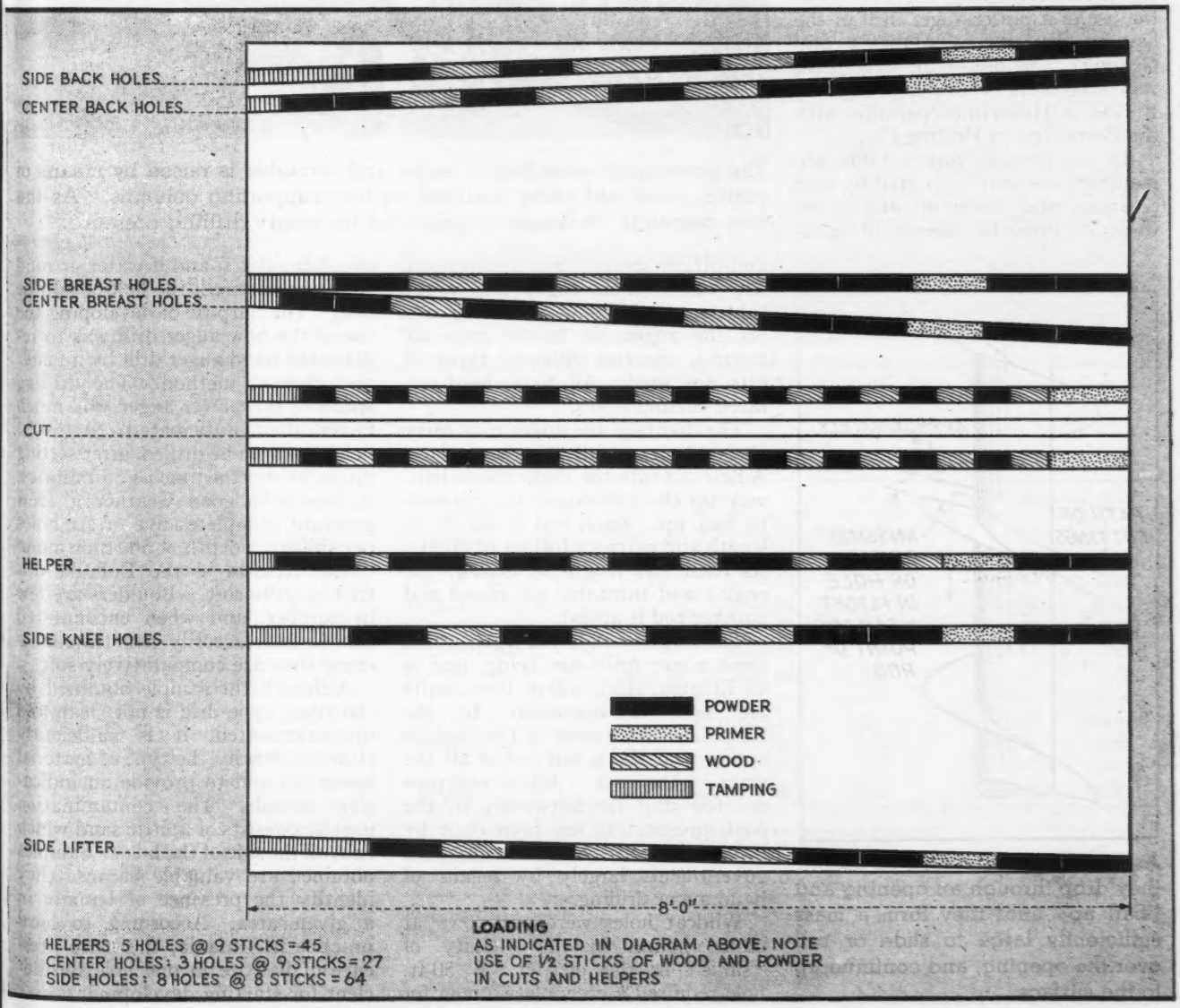
(c) For method of loading see sketch. Holes 2, 4, and 6 are loaded the same as holes 3 and 5. Holes 13 and 7 are loaded the same as hole 12.

(d) Cut fuse to insure firing in proper rotation, as per sketch.

(e) Split ends of fuse for one inch and light in rotation, as per sketch.

(f) Open air line and leave drift immediately.

The experience with this round indicates that 8 ft. can be broken quite easily and consistently in solid sulphide ore in a 5x7½ ft. drift and that there are possibilities of extending the length of this round even beyond 8 ft. provided there is sufficient drilling time.



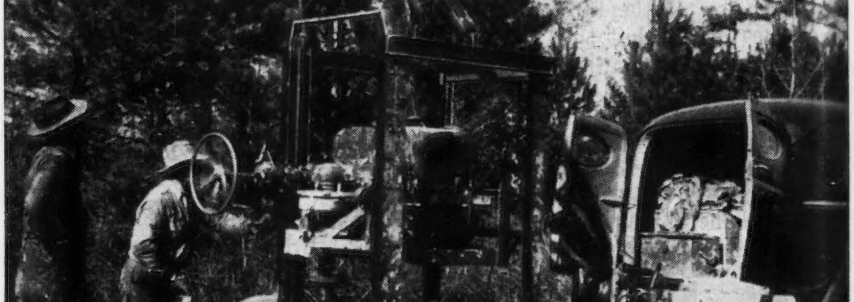
Power-Driven Auger Drill Cuts Exploration Costs

LEON W. DuPUY, *Assistant Regional Engineer, Eastern Region, Bureau of Mines.*

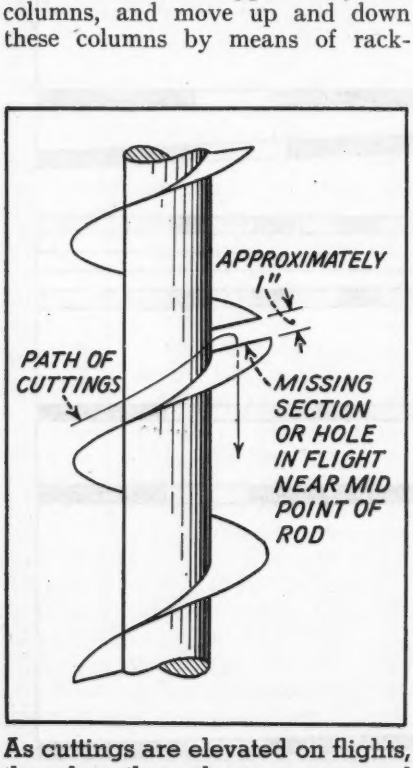
THE WORK OF THE FEDERAL BUREAU OF MINES under the Strategic Minerals Act and current appropriation bills during the past several years has included the use of many types of drilling machines, made necessary by the difference in the hardness and character of the minerals cut.

In its exploratory work the Bureau has utilized diamond drills, churn drills, rotary bucket drills, pneumatic hammers, power and hand augers, and "seismograph" drills. One of the most interesting innovations is the use of a power-auger drill in the bauxite deposits of Alabama and Georgia. The use of the auger drill was successfully developed by the Bureau of Mines in cooperation with the Pennsylvania Drilling Co.,

An engine and rotary table are mounted in a unit supported by four columns, and move up and down these columns by means of rack-and-pinion gears. See illustration. The weight of the engine and rotary table supplies the pressure necessary for the auger bit to cut into the ground. Several different types of bits are used. All have hard-surfaced cutting edges.



The power unit consisting of motor and turntable is raised by means of pinion gears and racks mounted on four supporting columns. As the unit descends, its weight supplies the necessary drilling pressure.



As cuttings are elevated on flights, they drop through an opening and "ball up" until they form a mass sufficiently large to slide or roll over the opening, and continue up to the surface.

The flights of the auger rods carry the cuttings rapidly to the surface. A hole cut into the flight about halfway up the rod causes the cuttings to ball up. Each rod is 3½ ft. in length and carries a full set of flights. As each rod length is drilled, the engine and turntable are raised and another rod is added.

The largest single job upon which these auger drills are being used is at Eufaula, Ala., where three units are now in operation. In the Eufaula district most of the bauxite occurs near sinks, but not in all the sinks of the area. Actual outcrops are few and far between. In the past, prospecting has been done by private parties and also by the government, largely by means of hand auger drilling.

Wildcat holes were put down at many points in the vicinity of "sinks" in the district. A 50-ft. hole required a crew of two men for two 8-hr. shifts, and if water or mud were encountered, the hole would be lost. The purpose of developing the use of the new auger drill was to replace the hand auger drill by a faster and cheaper method. The drilling speed of the power auger was much faster than anticipated. A 50-ft. hole can often be drilled, after setting up, in as short a time as 35 minutes. In normally good weather a crew generally completes five or six holes per shift to a depth of 50 ft. or more.

The bauxite in the Eufaula district is quite soft. Boulders are few in number, and when encountered can be satisfactorily penetrated because they are comparatively soft.

Although the sample obtained by the auger type drill is not clean and uncontaminated, it is sufficiently clean to identify the type of material being cut and to provide an indicative sample. The contamination usually consists of a little sand which rubs off the side of the hole. Samples obtained are valuable because they identify the presence of bauxite in a given area. According to local practice in Eufaula, the mere presence of bauxite in one hole is sufficient for starting development.

Orebodies are delineated by use of a drive-pipe sampling device and further use of the auger drill. As the deposits are comparatively uniform, the grades determined by drive sampling are sufficiently accurate. A few uncontaminated drive-pipe samples are usually taken to determine the proper grade of the ore developed.

Drilling cost in Eufaula has been exceptionally low. The drills are rented from the contractor upon the basis of $5 per hour of actual operation. In addition, the Bureau of Mines supplies the oil and gasoline; and the contractor supplies the labor, repairs, and all the tools needed to accomplish the work. A breakdown of total drilling costs to July, 1944, is shown in the accompanying table, which also lists drilling costs for January, 1944, an average month under present conditions. Footage records are also shown. The best record was made during the month of June, 1944, when three machines drilled a total of 35,400 ft. at a cost of 16.7¢. per foot for the contract, and a total operating cost of 22¢. per foot.

During the early part of the work, only one drill was used on the property, as it was experimental in every way. It was necessary to develop a procedure to utilize properly the best that was in the equipment. Attempts to introduce the equipment provoked such comment as, "It isn't any good"; "No hope to use such junk on the property"; and, "It will never work." Now, however, the very people who criticized the equipment are endorsing it enthusiastically.

As a result of the auger drilling campaign in the Eufaula area, 76 minable deposits of bauxite had been discovered and developed to July 1, 1944. All deposits have shallow overburden less than 50 ft. in depth and are mined by open-pit methods. The ore is stripped by Le Tourneau Carry-alls and is mined by both power shovel and Carry-all. The ore is dried in one of the several drying plants in the area and then shipped for treatment. Most of the ore shipped during the past year has gone to chemical industries.

The mines at Eufaula are operated by comparatively small companies. The companies now producing in the area are: Barbour County Bauxite Co.; Bauxite Company of Alabama, at Abbeville; Republic Mining & Manufacturing Co., of Eufaula; Bauxite Mining & Refining Co. of Eufaula; General Ores Co., of Eufaula; Floridian Co.; and D. M. Wilson Bauxite Co.

After equipment has been set up, it is possible to drill 50-ft. holes in 35 minutes. Approximately half of a 3½-ft. drill rod is here exposed.

AUGER DRILLING COSTS

	Total to July 1944		*For January 1944*	
		C. per Foot		C. per Foot
Contract	$ 72,083.73	22.2	$5,018.33	19.56
Govt. Labor	8,365.95	2.6	619.40	2.40
Supplies	5,924.98	1.8	556.28	2.17
Supervision	11,619.54	3.6	621.05	2.42
Transportation	2,838.94	0.9	125.60	0.48
Miscellaneous	521.44	0.2		
Total	$101,354.58	31.3	$6,940.66	27.04
Sampling	9,897.07	3.1	640.77	2.50
Total	$111,251.65	34.4	$7,581.43	29.54

FOOTAGE RECORD

	Total to July 1944	*For January 1944*
Auger drill	323,049	25,506
Drive pipe	1,221	141
Total	324,270	25,647

Solving a Tailings Re-treatment Problem

ALBERT SILVER, *Metallurgist, Tonopah, Nev.*

WITH THE RESULTS *of a year of testing and the actual experience of milling 100,000 tons from the area containing most of the tailings mined from Sump No. 2, it was decided in 1938 to fit out the plant for an increase in tonnage to 1,400 tons per day, improve the mechanical efficiency of certain parts of the plant, and proceed with a final effort which gave promise of a certain life of three years with the possibility of a fourth season. Diminishing value, which came before the end of the third season along with an acute water shortage, ended Period (3) after 1,028,000 tons had been milled, yielding a total of $396,327.27 or $0.385 per ton. The recovery indicated from the test work was $0.39 per ton. The actual profit margin, although small, would have been much greater if it were not for the failure of the water supply during the last half of the 1940 season, which cut tonnage to 1200 tons per day and resulted in an operating loss for the season.*

III. By successfully combining hydraulicking with cyanidation, the Bradshaw tailings operation has earned a place as one of the most unusual and interesting of recent gold mining ventures. This installment closes Mr. Silver's account of it.

Pumping Slimes. New installations in this department consisted of increased solution capacity to the high pressure system, one additional 4-in. two-stage Krogh split shell pump with a 60-hp. motor, two frame "C" Hydroseal pumps hooked up in series to deliver the pulp to the 8-in. Morris booster pump, and larger nozzles. The only untried pieces of equipment were the Hydroseal pumps, the source of gland solution for which was the main circulating solution line in the mill. Serious trouble developed at once from trash stopping the gland water entrance to the pumps and thus causing extreme wear of the rubber parts.

It was obvious that the circulating solution supply lines could not be trusted for a clean gland water supply, therefore the 4-in. gland line to the Hydroseals was connected up to the Butters filter filtrate tank, which insured filtered solution, and a 2-in. Manistee centrifugal pump was installed to provide a desirable pressure at the pump glands. A self-flushing screen was also designed and installed in the gland line. From this time to the end of the project the Hydroseals operated satisfactorily. Operating life of the wearing parts, handling 1,400 tons of dry solids per 8 hr. day at a sp. g. of 1.315, varied from two months for the rubber seal and suction bell liner to five months for the shell liner and runners, and occasionally more than one season for the engine side bell liners. Combined pump capacity was 1,800 gpm, for the three pumps in series, at a static head of 200 ft.

Cyanidation. To take care of the increased tonnage an additional 30 x 18-ft. settler tank and a new 56 leaf Butters filter box were installed. New twill leaves were made for this extra box. Tbe combined filter capacity was 1,450 tons per day and the number of settlers filled daily averaged sixteen.

Turkey red oil was used again as a pulp conditioner, but a new wrinkle in flocculation control was used during this entire period as a result of tests made in 1937. At first a dispersion of Aerosol OT gave good results, but the practice of boosting lime additions in colder weather spoiled its effectiveness. In a previous season caustic starch solution met the same fate. A more permanent dispersion was later worked out in a formula using Aerosol OT, white flake napthalene, and Solvent No. 1 alcohol, which maintained its effectiveness throughout the season.

Figuring from the actual reduction in soluble loss, the saving effected by use of this mixture amounted to 0.007 oz. of gold per ton of ore or a net saving of 2¢ per ton treated. Because the actual profit for this period was only 1.6¢ per ton treated, this saving was obviously well worth while.

Precipitation. No changes were made in this department except to make a further reduction in the amount of solution precipitated to 960 tons per day on account of the lower value of ore treated and the further necessity of reducing cyanide consumption. Only 14 leaves were used of the original 24.

Water Supply. Everything worked perfectly for two full seasons, 1938 and 1939, and up to the middle of June, 1940, when the various water sources dried up rather suddenly to their winter positions. It was noted at the beginning of the 1940 season that the winter build-up was practically nil because of a complete absence of snow and rain in the winter of 1939–1940. The rainy season of 1940 was also a complete blank. Four additional alleged water-producing shafts, brought in by means of deep well turbine pump installations, proved to be worthless.

In desperation the Goldfield town sewer discharge, after passing through an improvised septic tank, was pumped to the mill, adding a flow of about 6,000 gallons per day. In spite of this heroic effort the average mill tonnage dropped to less than 1,200 tons per day, which was not enough, and the operation closed down at the end of the 1940 season.

Supplies Used in Milling 1,028,000 Tons, Period 3, 1938–1940 Inc.

	Cost at Plant	Cost per Ton Milled	Total Used lb.	Consumption lb./ton
White cyanide	33,599.54	0.033	258,574	0.251
Quicklime	15,721.51	0.016	1,714,270	1.670
Zinc dust	3,456.41	0.003	32,700	0.032
Muriatic acid	2,429.60	0.002	76,820	0.075
Explosives	5,279.24	0.005	41,250	0.040
Misc. & water	37,700.91	0.037		
Total all supplies	98,187.21	0.096		

General Cost Distribution, Period 3

	Total Cost in Dollars	Cost per Ton in Dollars
Direct costs		
Labor	99,409.15	0.096
Supplies	98,187.21	0.096
Power	69,995.49	0.068
Total direct	267,591.85	0.260
Indirect costs		
Royalties	28,463.77	0.028
Adm. & salaries	34,650.00	0.034
Other indirect	30,109.33	0.029
Total indirect	93,223.10	0.091
Marketing costs		
Freight and treatment	6,496.37	0.006
Smelter losses	11,173.11	0.011
Bullion tax	1,001.11	0.001
Total marketing	18,670.59	0.018
Total all costs	379,485.54	0.369
Total production return	396,327.27	0.385
Operating profit	16,841.73	0.016

Operational Cost Distribution in $/Ton, Period 3

	Labor	Supplies	Power	Total
Pumping slimes	0.027	0.016	0.025	0.068
Cyanidation	0.048	0.062	0.027	0.137
Precipitation	0.015	0.007	0.008	0.030
Water supply	0.006	0.011	0.008	0.025
Totals	0.096	0.096	0.068	0.260

Metallurgical Results, Period 3

Total tons milled	1,028,000
Gold recovered, oz.	11,113.995
Silver recovered, oz.	11,803.43
Total value recovered, $	396,327.27
Calculated heads, oz. Au/ton	0.06425
Average tailing assay, oz. Au/ton	0.0173
Gold recovered, oz./ton	0.01081
Silver recovered, oz./ton	0.01148
Value recovered, $/ton	0.385

At that time the mill was cleaned up for final disposal, but because only low grade material had been treated, the cleanup was nominal. As a final gesture the remaining tailing areas were sampled, but only isolated spots showed sufficient value to pay. The proportion of the higher grade lower portion to the lower grade upper portion became increasingly less, and in the absence of a water supply which would permit of a boost in tonnage, when needed, it was deemed advisable to discontinue further effort.

Operating Crew

The crew, numbering from 19 to 21 men, under the able supervision of M. A. Tanner, mill superintendent, consisted of the following:—mining crew (day shift only): 1 pumpman, 1 nozzleman, 1 utility man, and 1 screen man; mill crew (3 shifts): 3 solution men, 3 filter men, and three helpers; repair and labor crew: 1 head mechanic, 1 repair mechanic, 1 carpenter, 1 filter repair man, 1 utility man, 1 repair helper, and two laborers. The pump man had charge of the mining crew; the utility man in this crew had many duties, he assisted in the starting and shutting down of the pumping plant, did the boring and blasting and acted as relief for the nozzle and screen men during the lunch period. Pipe line repairs, extensions, and moving of monitors were taken care of by the repair and labor crew on instructions from the nozzle man; repairs to pumps other than wearing parts was done by this same crew; replacement of worn parts was done by the mill superintendent and myself with the assistance of the mining crew.

Maintenance Men

A very careful record was kept of the wearing parts and a fairly successful schedule of maintenance established whereby much of the work was anticipated before disaster arrived. The mill crew or regular operators were under the guidance of the solution man on each shift and directly responsible to him in Mr. Tanner's absence. The repair and labor crew, directed by the head mechanic, had to synchronize their work with that of the mill operators in order to secure smooth operation.

The utility man on the repair crew took care of the various pumps in the water systems, assisted on the repair crew, occasionally operated the small nozzle and filled in as helper to the filter repair man when extra help was needed. The water system, although comprising eight different plants at all points of the compass from the mill, had automatically operated units and if no mechanical, electrical, or pipe line failures occurred, the work took up about two hours daily of the utility man's time. On the basis of his report back each day and the pumping records, necessary repairs and changes of pumping schedules were anticipated and taken care of as soon as possible.

One other worker on the repair and labor crew worthy of special mention was the filter repair man; on his ability to synchronize his work with the filter operation depended the care of the filter leaves, a very important assignment. The routine part of his work each day was to

General Cost Distribution, Entire Operation, 1927–1940 Inc.

	Total Cost in Dollars	*Cost per Ton in Dollars*
Direct costs		
Labor	487,158.46	0.118
Supplies	779,017.63	0.189
Power	335,696.92	0.082
Total direct	1,601,873.01	0.389
Indirect costs		
Royalties	200,676.16	0.049
Adm. & salaries	163,202.50	0.039
Other indirect	135,583.26	0.033
Total indirect	499,461.92	0.121
Marketing costs		
Freight and treatment	29,085.72	0.007
Smelter losses	67,311.35	0.017
Bullion tax	17,256.01	0.004
Total marketing	113,653.08	0.028
Total all costs	2,214,988.01	0.538
Total production return	2,703,717.58	0.657
Operating profit	488,729.57	0.119

Operational Cost Distribution in $/Ton, Entire Operation

	Labor	*Supplies*	*Power*	*Total*
Pumping slimes	0.039	0.024	0.032	0.095
Cyanidation	0.055	0.119	0.032	0.206
Precipitation	0.017	0.012	0.010	0.039
Water supply	0.007	0.034	0.008	0.049
Totals	0.118	0.189	0.082	0.389

Metallurgical Results, Entire Operation

Total tons milled	4,117,000
Cyanide consumed, lb./ton	0.389
Lime consumed, lb./ton	3.957
Zinc dust consumed, lb./ton	0.064
Gold recovered, oz	106,207.600
Silver recovered, oz	68,932.91
Total value recovered, $	2,703,717.58
Calculated heads, oz. Au/ton	0.06425
Average tailing assay, oz. Au/ton	0.02000
Gold recovered, oz./ton	0.04425
Silver recovered, oz./ton	0.02872
Value recovered, $/ton	1.126

remove, wash, examine, and repair 10 leaves from each filter box. These he set on a spare rack, then he removed the 20 leaves (from the previous day) from the 2 acid treatment boxes, drained and washed them, and put them in the vacated places in the filter boxes. He next put the leaves from the spare rack into the acid boxes, built up the acid strength, adjusted the acid circulators, acid-cleaned the sight feed glasses and went his way repairing leaves, building new leaves, or assisting the filter operator with his troubles if any. With occasional help during periods of accumulated bad leaves, this one man took care of the entire filter leaf maintenance and rebuilding, a job requiring plenty of ingenuity and ability to plan work and perform it effectively.

Repairs

The repair shop consisted of the minimum equipment required for maintenance work, such as a power operated drill press, threading machine, emery wheel, and hack saw, forge with blacksmithing tools, carpenter and mechanics work benches, electric drills, and a multitude of hand tools suited to the various operating units. All work beyond the capacity of this shop was done at the Campbell & Kelly foundry and machine shop in Tonopah. This organization also cast all of the many sizes of Morris and Wilfley pump parts needed as well as the nozzles, gears, pump plungers and cylinders, and a great many other machine parts. The convenience of this shop and foundry can be readily appreciated.

The mill operations being seasonal, a carefully planned procedure of maintenance and repair resulted in practically no lost time during the operating period, because major repairs were handled during the winter shutdown period.

Keeping Records

The Bradshaw Companies did not maintain an assay office because the firm of Downer Bros., commercial assayers, was available in Goldfield, and satisfactory results were obtained from them at a low cost. Essential assays, such as solution heads, tails, and mill residues, were recorded on a daily mill sheet along with other pertinent data for working up the monthly report. Record books, containing every conceivable piece of operating information which might be of the remotest value, were carefully kept by the shift bosses and checked daily by the mill superintendent and transferred to his composite daily report sheet.

A special filter record was maintained in a separate book by the filter men, and a general order book was kept for the operating crew, in which all orders were carefully recorded and posted by the superintendent and checked off by the shift foreman. An additional order book was supplied for posting repairs needed and other current information, and each item was gone over by the superintendent and the head mechanic as the first order of business each day.

In addition to these records the filter men, in a separate book, recorded the starting, stopping, and pumping time on each of the three trunk lines in the water system. These were indicated by different lights showing over the filter desk during the pumping period. The pumps were all controlled by time clocks or float switches so that the normal pumping schedule was very regular and when the record indicated an irregularity it was time to get out and look for trouble.

Each man recorded on his daily time card the distribution of his labor for the day and from these records an accurate distribution of labor was obtainable for the monthly reports. The power distribution was made according to motor ratings and time of operation. For the first eight years of the operation, before expansion made it necessary to employ help in the office, the entire burden of bookkeeper, purchasing agent, personal direction of operations, metallurgy, personnel, and what not fell to my lot.

OPERATING IDEAS

Gun Harnesses Explosive Power to Split Lagging

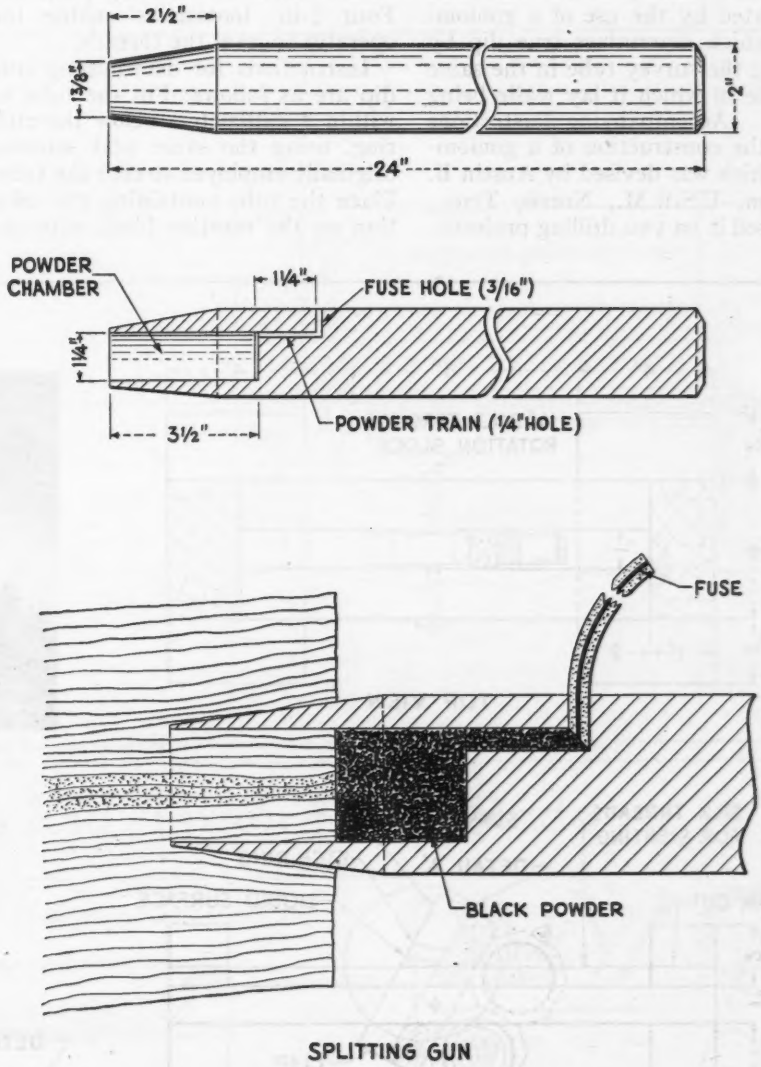
TO THE MINER who usually prefers to "fix things" with a primer and a stick of powder, the splitting gun described by Burton J. Westman, mining geologist, Etna, California, will no doubt have definite appeal. The principle of harnessing powder to eliminate manual labor is well demonstrated.

The splitting gun here illustrated may be made from cold-rolled steel at a cost of approximately three dollars. It has been used effectively in California gold properties to split red fir logs into two and occasionally three parts. An operator in the Iron Country, Michigan, split 16-ft. logs 2 ft. in diameter with a charge of only two tablespoonfuls of powder. A smaller gun has been used effectively to make split lagging out of smaller timber in some mining districts.

Directions for use of the gun are as follows:

1. Cut one end of a 1-ft. length of fuse at 45 deg. and insert in the fuse hole. The beveled end should be faced toward the powder train.
2. Pour one to two tablespoonfuls of black powder into the powder chamber, and with a slender wooden stick tamp the powder train full.
3. Place the gun in the heart of the log and drive it tight with a hammer.
4. Light fuse and go for shelter at right angles to the axis of the log and gun.

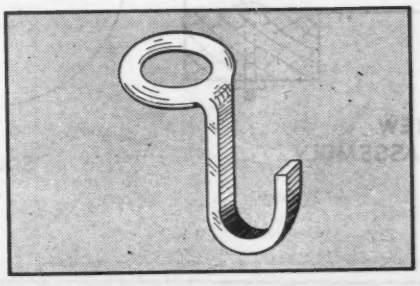
Although the gun seldom flies over ten to fifteen feet, it is wise to turn the log so that the gun will be stopped by a stump. During dry seasons the fuse should be tied to the gun to prevent starting forest fires.



SPLITTING GUN

Simple Rest Hook Supports Jackhammer

A WELDED REST HOOK eliminates holding a jackhammer during the process of drilling radial holes in wall cake and wall rings of a large calcining kiln. A. E. Place, shift superintendent of the Manganese Ore Co., Boulder City, Nev., states that it can be used to drill half of the inner circumference before it is necessary to rotate the kiln.



The ring of the hook is slipped over the shank end of a 3- or 4-ft. drill steel which is stood on end to serve as a support. The side rod of a jackhammer is then slipped over the hook. Paving breakers are similarly supported to trim kiln walls after cake has been blasted down.

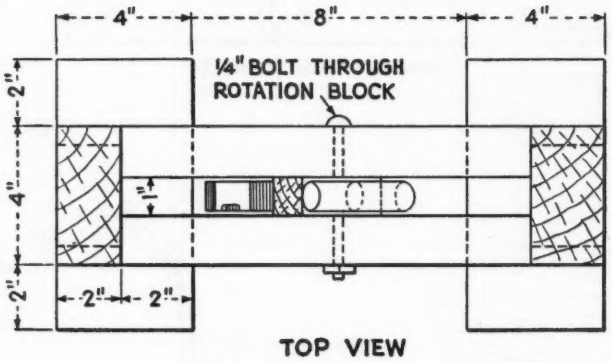
This hook could likewise be used underground.

Goniometer Simplifies Drillhole Dip Determinations

IN SURVEYING DRILLHOLES for inclination with hydrofluoric acid, a correction must be made for the meniscus of the etching fluid in the tube. Graphs showing corrections for various concentrations of acid and various angles of dip are usually consulted. This procedure has been eliminated by the use of a goniometer, which determines true dip by holding the survey tube in the same attitude in which it lay while being etched. Accompanying illustrations show the construction of a goniometer which was devised by Austin B. Clayton, U.S.B.M., Norris, Tenn., who used it on two drilling projects.

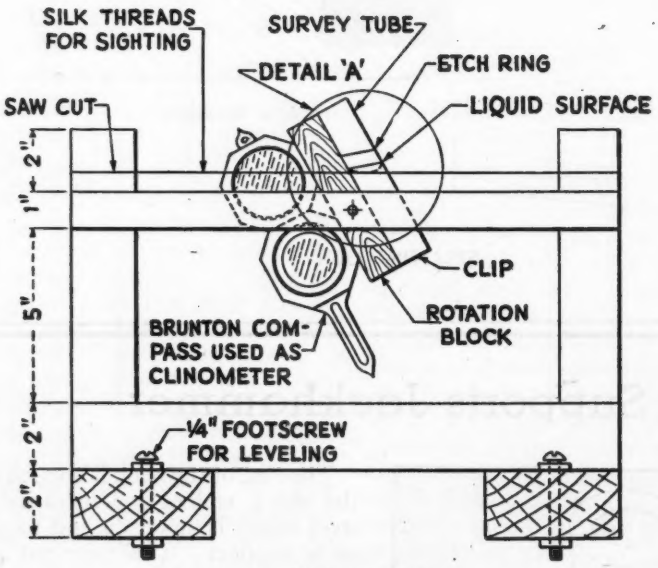
The etched tube is clipped to a wooden block which is free to revolve in a vertical plane about a horizontal axis consisting of a $\frac{1}{4}$-in. bolt. A wooden frame supports the rotation block. Two parallel silk threads are mounted horizontally on either side of the frame for sighting purposes. Four $\frac{1}{4}$-in. footscrews enable the operator to level the threads.

Instructions for determining true dip are as follows: Fill the tube to within 5 millimeters below the etch ring, using the same acid solution originally employed to etch the tube. Place the tube containing the solution on the rotation block with the etch ring nearly level with the parallel threads. The threads will aid in sighting across the ring to bring it truly horizontal. When the etch ring is horizontal, the liquid surface and the etch ring may be brought parallel by a slight rotation of the support block. Then measure the inclination of the survey tube with a clinometer. The clinometer on a Brunton compass will serve satisfactorily. The inclination measured on the tube while both etch ring and liquid surface are parallel is the desired true dip because the tube is tilted at the same angle at which it lay in the borehole.

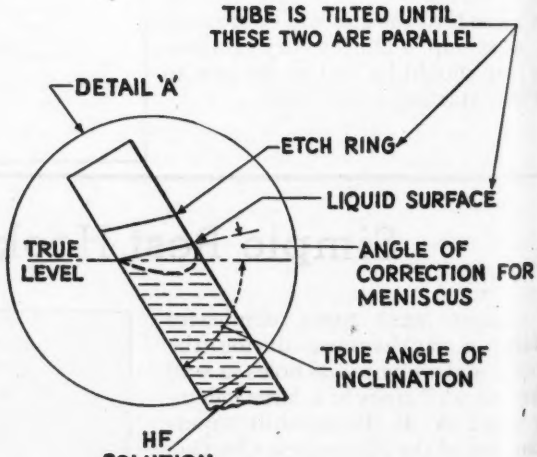


TOP VIEW

Clinometer on Brunton compass measures dip.



SIDE VIEW
GONIOMETER ASSEMBLY

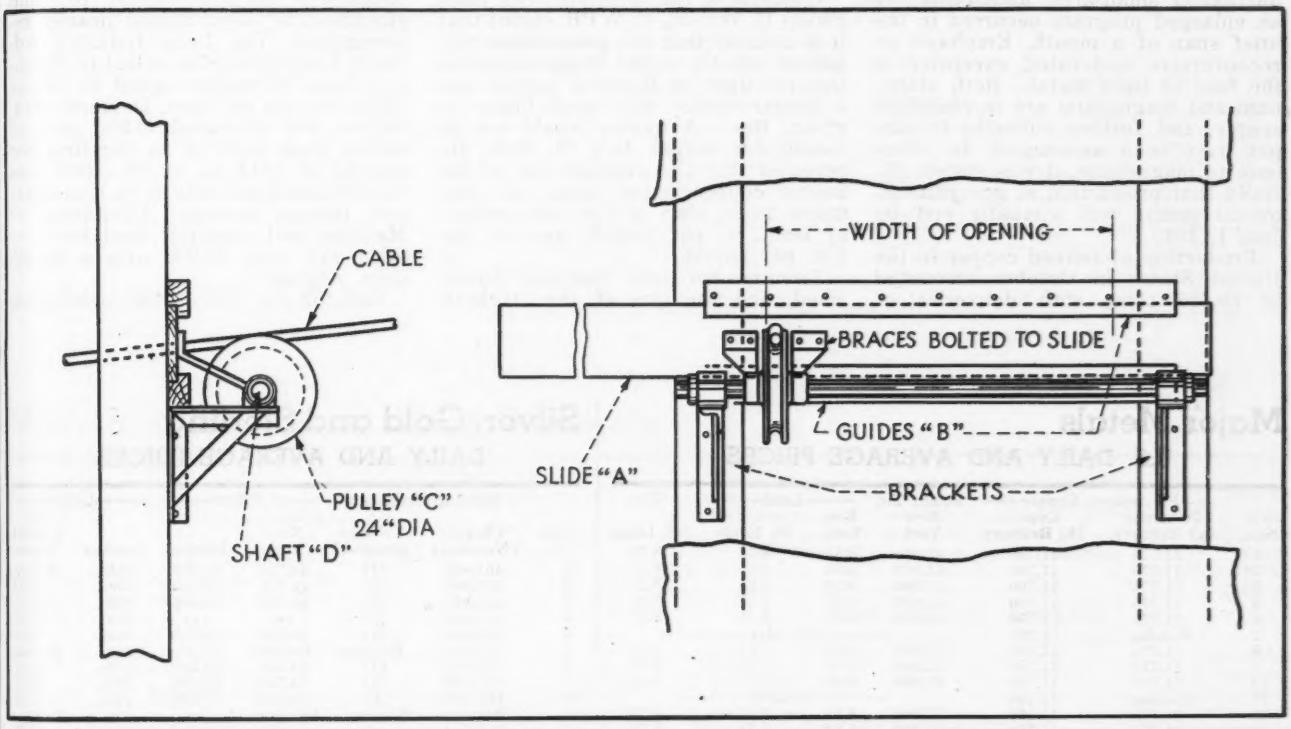


Slide Useful to Seal Hoist-Room Cableway

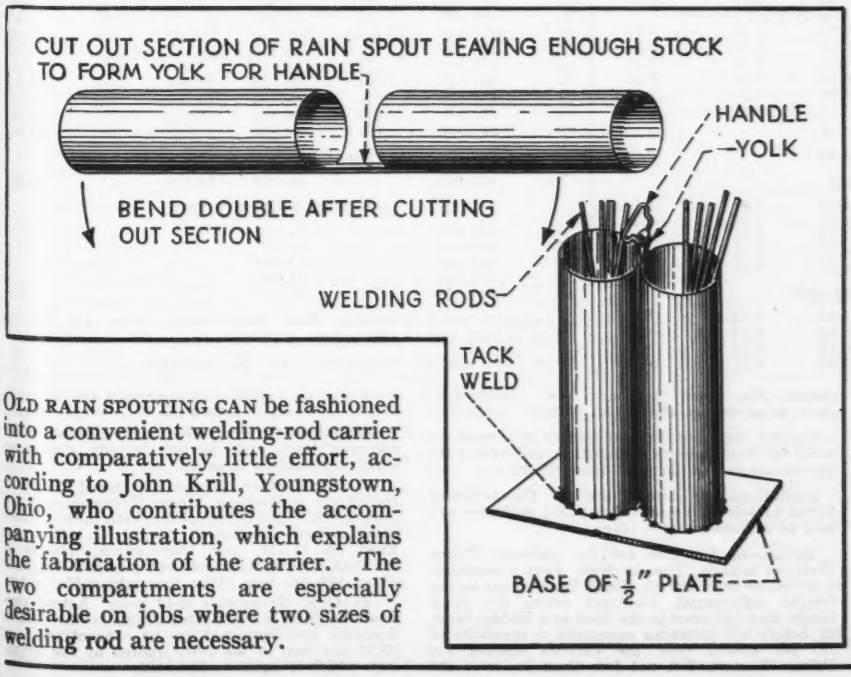
A HOISTING CABLE OPERATING on a wide-faced drum requires an opening in the hoist-room wall almost as long as the drum is wide. The sliding seal shown in the accompanying sketch conserves heating fuel effectively in hoist houses in winter.

A wooden slide *A*, with a hole for the cable, slides in grooves behind the two wooden guides *B*. The guide pulley *C*, which revolves on shaft *D* supported by two brackets attached to the posts of the building as shown, travels back and forward with the cable. Two steel braces are fastened to the slide *A* with a fork in the lower end to extend over shaft *D*. These are in close contact with the pulley, and as the cable moves the pulley along the shaft *D*, the pulley slides *A* with it. The cable itself does not come in contact with the sliding boards as it does in some other designs.

Cost of the arrangement is low because most of the parts can be made from scrap materials.



Welding Rod Carrier Easily Made


CUT OUT SECTION OF RAIN SPOUT LEAVING ENOUGH STOCK TO FORM YOLK FOR HANDLE
HANDLE
YOLK
BEND DOUBLE AFTER CUTTING OUT SECTION
WELDING RODS
TACK WELD
BASE OF 1/2" PLATE

OLD RAIN SPOUTING CAN be fashioned into a convenient welding-rod carrier with comparatively little effort, according to John Krill, Youngstown, Ohio, who contributes the accompanying illustration, which explains the fabrication of the carrier. The two compartments are especially desirable on jobs where two sizes of welding rod are necessary.

Glance at the operating ideas displayed on these pages, and then ask yourself this simple question: Why don't I send E.&M.J. a description, shop drawing, or sketch of some of the interesting, helpful shortcuts or useful ideas which have been developed in the mine or plant in which I work? E.&M.J. pays $5 or more for each idea published.

MARKET SUMMARY

PRODUCTION SCHEDULES for munitions in which the major non-ferrous metals occupy an important place were actually increased during November. WPB officials announced that the entire program would be maintained at a high level over the next three months. The switch from curtailment in production of small-arms ammunition to an enlarged program occurred in the brief span of a month. Emphasis on reconversion moderated, excepting in the field of light metals. Both aluminum and magnesium are in abundant supply, and further cutbacks in output have been announced. In reference to magnesium, it was stated officially that production at government-owned plants will virtually end by Jan. 1, 1945.

Production of refined copper in the United States in October amounted to 89,459 tons, with deliveries of 126,590 tons. Some 35,000 tons of the quantity invoiced for October shipment consisted of copper produced outside of this country. Nevertheless, the stockpile has increased to 345,000 tons, reflecting continued large importations from Canada, Mexico, and South American countries.

Concerning the premium price plan, Philip D. Wilson, of WPB, stated that it is unlikely that the government will adhere strictly to the 30-day cancellation privilege on B and C quotas, and a longer notice will most likely be given. Basic A quotas would not be cancellable before July 31, 1945. He revealed that the average cost of domestic copper today under the premium price plan is 13c. per pound; of lead, 8c. per pound; and of zinc 11c. per pound.

Demand for lead has not diminished, and the size of the stockpile again has been reduced, dropping to 115,000 tons. With consumers absorbing more than 70,000 tons of lead a month, new sources of supply will have to come into the market to keep the reserve supply above the minimum 100,000 tons. In the event that additional lead is not forthcoming, consumers may be asked to limit purchases to cover actual nearby requirements. The Lead Industry Advisory Committee was called to Washington as November ended to confer on the supply problem. Domestic production has averaged 44,900 tons of refined lead monthly in the first ten months of 1944, of which 5,000 tons was obtained monthly from secondary and foreign sources. Allotments of Mexican and stockpile lead have totaled well over 30,000 tons a month since August.

Call for zinc from brass makers has

Major Metals

U.S. DAILY AND AVERAGE PRICES

1944 Nov.	Electrolytic Copper: Domestic (a) Refinery	Electrolytic Copper: Export (b) Refinery	Straits Tin: New York	Lead: New York	Lead: St. Louis	Zinc: St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	Holiday	11.700		Holiday		
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	Holiday	11.700		Holiday		
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	Holiday	11.700		Holiday		
24	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
		AVERAGES FOR MONTH				
Nov.	11.775	11.700	52.000	6.50	6.35	8.25
Nov.		AVERAGES FOR WEEK				
1	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
Nov.		CALENDAR WEEK AVERAGES				
4	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.225c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman, Under Treasury order of July 6, 1939, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout November.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

1944 Nov.	Sterling Exchange: "Checks" (Nominal)	Sterling Exchange: "90-day demand"	Silver: (c) New York	Silver: London	Gold: London	Gold: (d) United States
1	401.000	(f)	44.750	23.500	168s.	$35.00
2	401.000	(f)	44.750	23.500	168s.	35.00
3	401.000	(f)	44.750	23.500	168s.	35.00
4	401.000	(f)	(e)	(e)	(e)	35.00
6	401.000	(f)	44.750	23.500	168s.	35.00
7	Holiday	Holiday	Holiday	23.500	168s.	Holiday
8	401.000	(f)	44.750	23.500	168s.	35.00
9	401.000	(f)	44.750	23.500	168s.	35.00
10	401.000	(f)	44.750	23.500	168s.	35.00
11	Holiday	Holiday	Holiday	(e)	(e)	Holiday
13	401.000	(f)	44.750	23.500	168s.	35.00
14	401.000	(f)	44.750	23.500	168s.	35.00
15	401.000	(f)	44.750	23.500	168s.	35.00
16	401.000	(f)	44.750	23.500	168s.	35.00
17	401.000	(f)	44.750	23.500	168s.	35.00
18	401.000	(f)	(e)	(e)	(e)	35.00
20	401.000	(f)	44.750	23.500	168s.	35.00
21	401.000	(f)	44.750	23.500	168s.	35.00
22	401.000	(f)	44.750	23.500	168s.	35.00
23	Holiday	Holiday	Holiday	23.500	168s.	35.00
24	401.000	(f)	44.750	23.500	168s.	35.00
25	401.000	(f)	(e)	(e)	(e)	35.00
27	401.000	(f)	44.750	23.500	168s.	35.00
28	401.000	(f)	44.750	23.500	168s.	35.00
29	401.000	(f)	44.750	23.500	168s.	35.00
30	401.000	(f)	44.750	23.500	168s.	35.00
		AVERAGES FOR MONTH				
Nov.	401.000	..	44.750	23.500	..	35.00
		AVERAGES FOR WEEK				
1	401.000	..	44.750	..	..	
8	401.000	..	44.750	..	..	
15	401.000	..	44.750	..	..	
22	401.000	..	44.750	..	..	
29	401.000	..	44.750	..	..	

Calendar week averages, New York Silver: Nov. 4th, 44.750; 11th, 44,750; 18th, 44.750; 25th, 44.750.

(e) Not quoted (Saturday). (f) No quotation.

increased, and consumption in this field is expected to grow again under the expanded ammunition program. Stocks of zinc at the end of October amounted to 244,209 tons, according to the American Zinc Institute, but, with production falling moderately and consumption turning upward, there was some hope that the large reserve supply will be reduced before long.

Inability to increase production because of weather conditions and labor shortages kept quicksilver in a strong position. Domestic production has been holding at around 2,500 flasks a month, whereas consumption has increased to 3,900 flasks under unexpected war demands. Import statistics are not available. The price in New York advanced from $113 per flask to $118. WPB will release stockpile metal on rush war orders.

The stockpile of aluminum continues to increase and the reserve supply is estimated at 250,000 tons.

Bolivia exported the equivalent of 32,494 metric tons of tin in the first ten months of 1944. More than half of this tonnage was shipped to the United States.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for October and November.

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations, (e) Special shapes sold to platers.

	Oct.	Nov.
Quicksilver, N. Y. flask	109.200	116.304
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b)	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80
1943	88.74		

	1942	1943	1944
January	85.39	88.74	88.74
February	85.90	88.74	88.74
March	85.90	88.74	88.74
April	85.90	88.74	88.74
May	85.90	88.74	88.74
June	85.90	88.74	88.74
July	85.90	88.74	88.74
August	85.90	88.74	88.74
September	88.74	88.74	88.74
October	88.74	88.74	88.74
November	88.74	88.74	88.74
December	88.74	88.74	....

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated
(Dec. 1, 1944)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb.	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb.	$1.25
Cadmium, commercial sticks, lb.	90c.
Calcium, lb., ton lots, 97@ 98 percent, cast	$1.85
Chromium, 97 per cent grade, lb.	89c.
Cobalt, 97 to 99 per cent, per lb.	$1.50
Indium, troy oz.	$7.50
Nickel, electrolytic cathodes, lb.	35c.
Magnesium, 99.8 per cent, carloads, lb.	20½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation) troy oz.	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$118.00
Selenium, 99.5 per cent, lb.	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb.	14.75c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50 nom.
Titanium, 96 to 98 per cent, lb.	$5.00

METALLIC ORES

Beryllium Ore, 8 to 12% BeO, f.o.b. mine, per unit	$14.50
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.01
Manganese, Metals Reserve Co. sales price, per long-ton unit of Mn contained, 48 per cent, subject to premiums and penalties, effective May 15, 1944: 85c. (duty paid) New York, Philadelphia, Baltimore, Norfolk, Mobile, and New Orleans; 91c., Fontana, Calif., Provo, Utah, and Pueblo, Colo.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 60 per cent, duty paid	$24.00
Domestic, 60 per cent and upward	$24.00@$24.50
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	27½c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28
(a) Prices at mines, small lots, normally several dollars less.	

METALLIC COMPOUNDS

Arsenic Oxide (arsenic) lb.	4c.
Cobalt Oxide, 70 @ 71 per cent, lb.	$1.84
Copper Sulphate, 100 lb.	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pounds of Cr. contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum, 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.60@8.10c.
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U.S. funds), ton:	
Crude No. 1	$650@$758
Crude No. 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$8.50@$9.00
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$8.25@$8.50
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 60 per cent, all rail movement, ton	$30.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00
Mica — Colonial Mica Corp., agent for Metals Reserve Co., offered to buy No. 1 and No. 2 domestic sheet mica, 1½ and 2 in. and larger, full trim, at $8 per pound from Aug. 7 to Mar. 31, 1945. Those who wish to sell on a three-quarter trim basis will obtain $6 per pound, as previously stated.	
Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of s, c i f. Atlantic ports	12c. nom.
Silica, in bags, 325 mesh, ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base price, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb.	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Ickes' Policy on Alaskan Reservations Is Opposed

What originally started to be a simple claim for the protection of fishing rights by Alaskan Indians apparently has grown to include the mineral rights and all natural resources of a large part of southeastern Alaska. The Indians have been encouraged by the Bureau of Indian Affairs in the Department of Interior to assert that their ancestral rights entitle them to the exclusive occupancy of the area included in their petitions. A peculiarity of law requires that the claims be made to the land and then incidentally to the waters adjacent thereto, the latter being the feature in which the Indians are primarily interested. Naturally the claims were for much more than the applicants expected to get.

This set the stage for the Secretary of the Interior to suggest that this land be set aside as an Indian reservation. Non-Indian residents of Alaska and all mining, lumber, and fishing industries, both within and outside the territory, are violently opposed to the suggestion.

On Oct. 24 the Board of Trustees of the Seattle Chamber of Commerce approved a recommendation of its Alaska Committee which had the concurrence of the Board's National Affairs Committee opposing the proposal of the Secretary to set aside large portions of land in Alaska for use of certain small Indian groups. Only three claims have been considered at the various hearings held both in Alaska and in Seattle. These involve relatively small areas, but additional claims now pending include most of southeastern Alaska from Prince Rupert to Skagway. The possible inclusion of most of this area in extensive Indian reservations would bring probably the most important mineralized area of Alaska in direct control of the government.

This is the one accessible district of Alaska which will be the first to be exploited if it is not "locked up." Here are known deposits of copper, zinc, tungsten, and other of the base metals. Coal is present in commercial quantities, and marble and limestone are being produced. It is the opinion of some high-ranking geologists that mineral resources of the interior may never be developed except for the production of gold, because of transportation difficulties.

The total area involved in all the Indian claims is roughly 120 miles by 450 miles. Within it live the largest white population of any district of Alaska. Within it are many great forests, lumber mills, and power sites, as well as the great salmon fisheries and the mineral deposits already mentioned.

The Department of Interior seems to be basing its action on two legal points. One is the right of the Secretary to establish reservations. The Wheeler-Howard Act of June 18, 1934, relating to Indian reservations, did not apply to Alaska. An amendment in 1936 took care of this and gave the Secretary of the Interior power to designate Indian reservations in Alaska, in fact more power for operations there than he may exercise in the United States. Under the law seven reservations have already been established in Alaska, the largest of which has an area of about 1½ million acres. This is the Chandalar Reservation, north of Fairbanks.

The second legal point is based on the aboriginal rights of the Indians. These rights were never extinguished, according to Department of the Interior legal authorities.

In voicing its opposition, the Seattle Chamber of Commerce states that the effect of the proposal "would upset the entire present economy of Alaska, block proposed statehood, and deter, if not actually prevent, the development of the great territory."

For some years the Department of the Interior has been plugging to get all minerals under its control. Officials of the General Land Office have proposed to extend the leasing act of 1920 to cover all minerals instead of the half dozen to which it now relates.

The proponents in the Department of the Interior of federal control of all natural resources are attacking on many fronts. There is constant war between the Department of Agriculture and the Department of the Interior over government lands that are in the control of the Forestry Service, a Department of Agriculture agency. There is constant effort to have forestry lands declared national monuments, and legislation is constantly before Congress to extend the mineral leasing act and give the Department of the Interior wider control over the mining industry.

The importance of the plan of the Secretary of the Interior to bring large areas of lands into Indian reservations, as proposed in Alaska, is that if the precedent can be established, Mr. Ickes needs no further legislation.

Wilbur Nelson Resigns As WPB Official

Wilbur Nelson resigned from the War Production Board on Dec. 2, after exactly 3½ years' service with WPB and its predecessor, the Office of Production Management. Dr. Nelson was the first director of what is now the Mining Division of the War Production Board. One of his many contributions to the war effort was his untiring battle to secure for the mining industry priority assistance that enabled mines, mills, and smelters to compete on equal terms with any war program for maintenance, repair, and operating supplies. It was only after a terrific struggle which found Wilbur Nelson and Donald Nelson on one side against General Somervell on the other side that the necessary high ratings were made available to the mining industry under order P-56.

The clause "in case of breakdown, imminent breakdown or other emergency, the application may be made by telegraph or telephone . . . " is another feature of the order for which Dr. Nelson was responsible. Result has been that no mine has been closed for want of repairs long enough to hinder the war effort.

The last position held by Dr. Nelson with the Minerals Resources Coordinating Division will not be filled. That agency will be discontinued and the few remaining duties that must be carried on will be distributed in the office of the Metals and Minerals Vice Chairman.

Next September Dr. Nelson will resume his position on the faculty of the University of Virginia. In the interim he will devote his time to consulting work and in the preparation of his university courses.

Metal-Price Study to List Production Costs

A basis on which metal prices may be established if and when the premium price plan is suspended is being worked out by a joint effort of three government agencies—OPA, WPB, and the Tariff Commission. A statistical study of production costs is being made—mine by mine—from figures submitted by the operators.

When this monumental task has been completed, sometime after the first of the year, the mines can be listed in the order of their production costs.

It will then be possible (in theory) to determine what price will have to be established for any one of the premium price metals to secure a required production. Supposedly it will be possible for government officials to know exactly what mines will be able to produce profitably at any given price.

By this means, it is hoped to cut off unneeded high-cost production but at the same time prevent the mining industry from experiencing the difficulties of other military production programs in which schedules have had to be increased after a previous cut. Another aim of the study is to compile information which will enable official Washington to determine accurately whether it will cost the taxpayer more to continue operations under the differential subsidy of the premium price plan than to

have all metal producers operating under a fixed ceiling price.

One consideration which will modify any future action to change metal prices will be the probable effect on the government-owned stockpile. There is a great deal of maneuvering which can be done before any of the premium price metals are even brought out of the ground, let alone impounded in a government-owned stockpile in accordance with Section 22 of the Surplus War Property Act.

Never before have comparable cost figures been available for study by government officials. In the present instance the information will not be made public, as cost figures of individual operators are highly confidential. The study will produce figures showing the cost of metal in pig form, including smelting costs and local taxes but not including federal taxes, depletion, or depreciation. The information is obtained from reports made to the Premium Price Committee which must meet a certain bookkeeping pattern, excluding overhead items which vary widely from mine to mine and company to company.

Quest for War Minerals By USGS to Continue

War problems will continue to engage the attention of the U. S. Geological Survey during the coming year, according to Survey Director W. E. Wrather. Not the least of the war programs to be continued will be the geological investigations made in connection with the problems of producing critical and strategic minerals and metals. In the prompt publication of the results, a very practical service to the mineral industry is being rendered. Maps and supporting data will continue to be made available in time to be of use rather than at some late date when they will have merely historical interest.

Already there are scheduled about 50 studies upon which reports will be made public, probably averaging about one a week. In the last year the areas investigated have varied according to the relative supply of minerals. The shortage of mica led to the investigation of most of the pegmatite formations in the Appalachian range.

Supply of Truck Tires At Mines Again Tight

Mines along with other civilian industry must assume their share of the shortage of truck tires. Officials of the WPB Mining Division hold no hope for improvement in the supply of tires in the first quarter of 1945, nor in the second quarter if Germany has not been beaten by that time. Although the output of tires has been increased sharply in recent months, output has not kept pace with the demands of the Army. Fewer tires will be available in the immediate future than there were in the immediate past.

International Action in Tin and Copper Likely

International commodity agreements covering the production and distribution of tin, copper, rubber, cotton, and possibly some other raw materials are probable soon after the close of the war. To handle the technical matters relative to the negotiations a group of commodity experts is being set up in the State Department in Assistant Secretary Dean Atcheson's Office of Economic Affairs. The expansion of the Commodities Division is of still more interest because of the emphasis on the export of capital goods as a prerequisite for national prosperity in all plans for postwar activities.

Until an official announcement to the contrary, the purpose and duties of the Commodities Division must be assumed to be as stated in the departmental order No. 1218 issued Jan. 15, 1944, which reads:

"3. Commodities Division. The Commodities shall have responsibility for the initiation and coordination of policy and action in all matters pertaining to: (a) the production and control and the distribution in international commerce of major commodities such as rubber, tin and the heavy metals, petroleum and petroleum products, coffee, sugar, wheat and cotton; (b) international commodity arrangements; (c) international fisheries, including fisheries surveys for the purpose of providing food fish for the American armed forces and for our Allies; and (d) within the scope of its responsibilities, liaison with intergovernmental agencies concerned with international commodity problems, with the Department of Agriculture, the Office of the Petroleum Administrator for War, and such other departments and agencies as may be concerned."

Policy matters in regard to commodities in international commerce are to be handled by the Commodities Division, according to the best available information. A staff of technical men at present only one or two for each major industry will act as liaison between the State Department and other government bureaus having technical men. This staff will assist in the determination of policy in such matters as trade agreements to secure tariff concessions for the export of U.S. surpluses.

Problems of international commerce that must be solved by the government are to be handled by two committees. The lower committee which does the spade work is to be made up of representatives of seven agencies, the Departments of State, Agriculture, Commerce, Interior, the Tariff Commission, Foreign Economic Administration, and War Production Board. This committee makes the first recommendations which are sent to the higher committee for decision.

The Executive Committee on Foreign Economic Policy is the official name of the top committee, which operates in the stratosphere where broad economic problems are handled, including such as international labor policy and finance. Only six agencies are represented on the Executive Committee, the Departments of State, Commerce, Labor, Treasury, Agriculture, and Tariff Commission.

Fluorspar Mines Pushed To Produce Acid Grade

Producers of fluorspar have been called upon to meet the enlarged requirements of the producers of hydrofluoric acid. Not only must the fluorspar mines produce more acid grade material to meet the demands of an industry that has almost doubled during the war, but better quality material is wanted.

All of the present difficulties in regard to supply were not anticipated. In expanding production of anhydrous hydrofluoric acid to 9,500 tons per quarter, a rate for which facilities will be ready by next February, the plan was to use "acid" grade material that had been furnished to the aluminum refiners for the production of synthetic cryolite. But this material proved unsatisfactory when put into production. The presence of sulphur and other impurities could not be overcome in the acid manufacturing plants. Excessive corrosion, causing frequent equipment failures, has been a natural result and one of the major difficulties.

Complaining that the inferior quality of some of the fluorspar now being mined retards production, the acid manufacturers put the problem up to the War Production Board. WPB officials suggested that "cooperation between producers of fluorspar and hydrofluoric acid is necessary for maximum utilization of available supplies," and that "specifications should be relaxed wherever possible, and arrangements made for the blending of the various grades of fluorspar." Facilities of existing mills have been expanded to carry the added load.

Fluorspar producers have been warned that stop-gap measures that have been suggested are not the answer. Unless they are prepared to produce a uniform product of high quality the acid producers may be forced to go into the business of mining their own raw material. There is no question that the chemical industry has both the money and the "know how" to do the job.

On the credit side of the ledger is the continuing importance of fluorspar in the postwar economy. Because the use of anhydrous hydrofluoric acid in the manufacture of high octane gasoline, in refrigerants, and Freon used as a propellant in aresol insecticide bombs will continue after the war, there is little danger of overexpansion of facilities in this field during the war. So great is the potential commercial importance of acid grade fluorspar that W. E. Wrather, Director of the U. S. Geological Survey, has placed it at the top of the list of non-metallics that will receive special study by his organization when the Survey's direct war work will permit.

NEWS OF THE INDUSTRY

SEC Revisions Proposed to Aid Mine Financing

Modification of SEC and state regulations to facilitate financing of mining enterprises by the sale of securities to the public was discussed by mine operators, underwriters of securities, members and representatives of the Securities and Exchange Commission, and investment commissioners of the 48 states at a conference held in Butte, Mont., Nov. 10–11 at the invitation of Governor Sam C. Ford.

Representatives of mining companies attempting to sell stocks in other states through the mails charged that the Blue Sky laws of numerous states discouraged such practise. In answer to this charge, Allan S. Richardson, Securities Commissioner of Colorado, asserted that 40 states have adopted security laws, and that the duty of each security commissioner "is to look out for the interests of the citizens of his state and enforce the law as he has it from the state legislature." He emphasized that the 40 states offer to any legitimate enterprise the opportunity of selling securities in those states provided the issuer complies with requirements of full disclosure.

Carl J. Trauerman, Montana mining engineer and chairman of the conference, summarized this phase of the discussions by stating that fully registered securities include full disclosure, and therefore National Investment Commissioners, at their forthcoming December meeting in St. Louis, would be requested to develop some scheme whereby fully registered securities would automatically be exempt from all state Blue Sky laws.

Form S-11, which was proposed by SEC to "meet the particular needs of the small, newly organized company having a mine in the exploratory stage," was discussed. As this form embraces only metalliferous mines, SEC commissioners were asked whether the form could be revised to include non-metallic properties also. B. Adelstein, SEC engineer, replied that it could be revised without too much difficulty.

Small Mine Owners Fear Law

Mr. Ward, president of the Western Mining Association, Montana, who spoke for small mine owners in seven counties, stated that the owners were fearful of violating the law if they solicited investments to finance their properties. He intimated that the legal procedure and regulations governing the sale of stock were so controversial among attorneys of SEC and other attorneys that members of his association were much confused.

The following Rule 240 for assessable shares of stock of mining corporations was proposed for consideration:

Assessable shares of domestic mining corporations, when offered for the account of the issuer for cash, are added to the classes of securities exempted as provided in Section 3 (b) of the Act, subject to the following terms and conditions:

(a) The sum of the following shall not exceed $100,000:

1. The aggregate offering price of the proposed offering of shares;

2. The aggregate offering price of the issuer's securities (other than securities effectively registered under the Act) being currently offered;

3. The aggregate sales price of the issuer's securities (other than securities effectively registered under the Act) sold to the public for its account within a period of one year immediately prior to the filing date of the prospectus required by paragraph (d);

4. The aggregate amount of assessments levied by the issuer on all shares within a period of one year immediately prior to the filing date of the prospectus required by paragraph (d); and

5. The aggregate amount of assessments to be levied by the issuer on all shares within a period of one year immediately following the filing date of the prospectus required by paragraph (d).

(Note: Paragraph (d) specifies 11 items which must be included in a prospectus to be submitted to prospective buyers of exempt issues.)

Elmer E. Johnston, chairman of the Legislative Committee of the Northwest Mining Association, Spokane, Wash., proposed that paragraphs 3, 4, and 5 be eliminated because they worked a hardship on mines using the form. He suggested instead that a simple rule be substituted which would permit the sale of $100,000 worth of assessable shares each year. He urged liberalization of rules so that the common man could understand them, and operate without fear.

Discuss $100,000 Limit

Mr. Johnston asked SEC representatives whether they thought the Commission would have any objection to an amendment to allow the present top figure of $100,000 (for certain securities exempt from registration) to be raised to $200,000 or even $300,000. Sumner P. Pike, SEC Commissioner, stated that it would be highly improper for the Commissioners to state their views. He added, however, that their minds were not closed to the subject.

Some members of the meeting objected to that portion of Rule 240, Sec. (d) which requires that commissions to underwriters be specified on the first page of the prospectus ("spread") which must be submitted to all persons solicited to buy exempt securities. The sentiment of the American Mining Congress meeting at Salt Lake City in 1939 was read into the testimony. At that time the congress protested that as commissions on mining stock were generally high, such information would cause the prospective buyer of stock "to throw the prospectus into the basket."

Wilson Clarifies WPB's Stand on Premium Prices

Procedure of administering the premium price plan will not be changed after victory in Europe, Philip D. Wilson, vice-chairman for metals and minerals, War Production Board, informed those attending International Mining Day, sponsored by the El Paso Chamber of Commerce, El Paso, Tex., Nov. 10 and 11.

Mr. Wilson pointed out that a substantial portion of the metal production costs the government much more than OPA ceiling prices, but the net result has been that the average cost of domestic copper is today about 13c. per pound; of lead, 8c. per pound; and of zinc, 11c. per pound. By far the largest portion of the metals imported comes into the country under the ceilings of 12c., 6½c., and 8¼c., for copper, lead, and zinc, respectively, with the duty waived.

In reference to the premium price plan, Mr. Wilson said:

"The premium price plan as extended after its inauguration in 1942 provided that the basic A quotas would not be cancellable before July 31, 1945, unless the national emergency were declared at an end before that date. Later, when the higher B and C premiums were instituted to give necessary relief to higher cost mines and to stimulate greater production the right to cancel these B and C quotas and premiums upon 30 days' notice was expressly reserved. . . . The War Production Board's responsibility under its charter from Congress is limited to the procurement of material to satisfy military and war-supporting civilian requirements. It has no authority whatsoever to acquire metals or minerals for strategic or defense stockpiles.

"There is, therefore, no logical reason why the government should continue to pay over 16c. for zinc or 25c. for copper when the time comes that there is sufficient metal available for war purposes at more reasonable prices. If that time should arrive before next July, it is unlikely that the government will adhere strictly to the 30-day cancellation privilege."

NWLB Approves Wage Rates For Coeur d'Alenes

The National War Labor Board has recently approved wage awards made by Verner E. Wardlaw, special government investigator appointed to arbitrate wage neogtiations between 17 companies and four locals of the International Union of Mine, Mill and Smelter Workers in the Coeur d'Alene district. Wage awards went into effect as of Oct. 5, 1944. Hearings upon which the decisions were based were held in February, 1944. Mining companies involved in the decision are Bunker Hill mine and smelter, Sullivan zinc plant, Sunshine, Morning, Page, Frisco, Jack Waite, Tamarack & Custer, Sherman Lead, Dayrock, Hercules, Coeur d'Alene Mines, Polaris, Spokane-Idaho, Hunter lease, and Hull lease.

Rates established by the arbitrator are as follows, and are designated as former rates, rates asked by union, and awarded rates:

WAGE RATES

Classification	Former	Asked	Awarded
For Mines:			
Miner	8.25	—	8.25
Drift miner	8.75	—	8.75
Raise miner	8.75	9.25	8.75
Timberman	8.75	—	8.75
Timber repairman	—	9.25	9.00
Mucking mach. man	8.25	8.75	8.25
Trackman	8.25	8.50	8.25
Blacksmith	9.00	9.50	9.00
Shaft repairman*	—	9.25	9.25
Driver heavy truck	—	8.25	8.25
Driver light truck	—	8.25	8.00
Watchman	—	8.00	8.00
For Mill:			
Flotation operator	8.50	9.00	8.50
Mill labor inside	—	8.00	7.75
For Sawmill:			
Head sawyer	—	9.25	8.75
Sawmill operator	8.00	8.75	8.00
Sawmill helper	8.00	8.75	8.00
Sawmill labor	7.50	7.75	7.50
For Smelter Mechanical Department:			
First class	8.75	9.00	8.75
Second class	8.25	9.00	8.25
Helpers	7.75	8.00	7.75
Oiler	7.75	8.25	8.00
For Sample Mill:			
Millman helper	7.50	8.00	7.75
Crusherman	7.75	8.00	8.00
Sample cutter	7.75	8.00	8.00
Ore unloader	7.50	7.75	7.75
For D-L Roaster:			
Clean-up labor	7.50	8.00	7.50
Inside plant labor	7.75	—	7.75
Inside clean-up labor	7.50	—	7.50
For Blast Furnace:			
Craneman	8.00	8.25	8.25
Hopperman	7.50	7.75	7.75
Breaking matte	7.50	7.75	7.75
Bag house operator	7.75	8.00	8.00
For Lead Refinery:			
Craneman	8.00	8.25	8.25
For Dry-Ore Plant, Antimony:			
Working shiftboss	8.25	8.50	8.50
Operators	7.75	8.00	8.00
Helpers	7.50	7.75	7.75
Antimony casting	7.50	7.75	7.75

*Rate to be paid for time spent on shaft work only. Classifications have been established where former rates are omitted.

Union demands for the following classification and rates for sawmill workers were denied: timber framer, $9; saw filer, $9; ratchet setter, $8.75; scaler, $8.50; wedge sawyer, $8.

Main-line motormen operating trolley powered equipment were awarded $8.75, and swampers on such equipment $8.25. Other main-line motormen will receive $8.50, and level motormen $8.25; swampers for these two classifications will receive $8.

Union demands for the elimination of definitions for first class and second class mechanics, welders, and electricians were denied. Wardlaw declared that present definition of second class is too general, and recommended that the parties agree on a definition and incorporate it in the agreement.

In a hearing conducted by the Nonferrous Metals Commission of the National War Labor Board in Salt Lake City, Oct. 16–18, representatives of MMSW cited the recently established rates in the Coeur d'Alene district as a reason for applying for higher rates in Utah. Counsel for the mine operators contended that application of the Coeur d'Alene wage scale would be outside present wage stabilization principles.

Mining Society Organizes Section at San Francisco

A Western section of the Mining and Metallurgical Society of America was organized at a meeting held at the Pacific Union Club, San Francisco, on Nov. 3. D. C. Jackling and W. W. Mein, counselors representing northern California, Nevada, and Alaska, arranged the meeting and were assisted by T. T. Read, of New York, who arrived by plane. Principal speakers included Dr. Otto Jeidels, vice president, Bank of America; Granville Borden, mining engineer and attorney with Standard Oil Company of California; John Forbes, economist of John Forbes & Co.; Robert Searls, attorney; and S. H. Williston, vice president Horse Heaven Mines, Inc.

Dr. Jeidels expressed the opinion that gold and silver will be necessary in the postwar monetary systems of the world, and that the U. S. silver purchase policy has played an important part in stabilizing the purchasing power of silver, thus aiding a billion people (half the population of the world) who regard silver money as a basis of value.

The evening's discussion was summed up in a resolution presented by Ira B. Joralemon, consulting mining engineer, which recommended that provision for bearing the postwar taxes be made through stimulation of mining enterprises to provide new tax sources. Charles White Merrill, supervising engineer, U. S. Bureau of Mines, San Francisco, was appointed secretary-treasurer of the newly formed section.

Mine Machinery Control Advised After "V-E" Day

Members of the mining machinery manufacturers Industry Advisory Committee recommended at a recent Washington meeting that present WPB controls on mining machinery be retained after "V-E" Day because of uncertainties which may prevail.

The committee advised that Order L-269 be revised and retained. L-269 establishes control of production and delivery of items under List A, which now contains critical and less critical items. A revision was suggested which would establish a List B of less critical items such as crushers, mine lamps, grinding machinery, ore-dressing, and coal preparation equipment.

Consideration was given to the possible abolition of Order P-56 after "V-E" Day. Order P-56 established procedures for operators to obtain maintenance, repair, and operating supplies for mining equipment.

Belgian Congo Maintains High Tin Production Rate

The Belgian Congo has been producing tin at a fairly high rate. The head of the Belgian Cabinet, M. Petillon, stated recently that output currently is at the rate of 21,000 long tons a year, which compares with the pre-war rate of 9,000 tons a year. To increase production in that area, it is understood that needed equipment and material were supplied by the United Nations.

Exports of tin from the United Kingdom in 1943 amounted to 12,251 long tons, against 10,164 tons in 1942. The Metal Bulletin, London, observes that "no doubt the bulk of these shipments were to Russia, whose tin requirements were made the special concern of this country under the allocation program of the Combined Raw Materials Board."

Alloying Metals Used in Gas-Turbine Plane Engine

Combinations of alloys with steel which are capable of withstanding high temperatures have contributed to the development of gas-turbine engines for warplanes. Fred K. Fischer, engineer of the Westinghouse Electric and Manufacturing Company, disclosed general facts concerning these alloys at a meeting of the Western Massachusetts Engineering Society. Although the exact formula of alloys used could not be revealed because of strict censorship, Mr. Fischer was permitted to state that tungsten, molybdenum, columbium, and titanium were used with such bases as nickel, cobalt, and chromium.

WPB Order Abolishes Mica-Graphite Division

The Mica-Graphite Division of WPB was abolished by an order effective Dec. 2, 1944. Its functions were consolidated with the Miscellaneous Minerals Division in the Office of the Vice Chairman of Metals and Minerals. As a result, the Miscellaneous Metals Division now includes the Mica, Fluorspar and Magnesite, and Non-Metals Sections. The Non-Metals Section units control graphite, beryllium, tantalite, and electrodes.

Officers of the Miscellaneous Minerals Division are as follows: James S. McGregor, director; Fred G. Rockwell and Frank F. Watts, deputy directors; and Harry D. Sharpe, assistant to the director. M. H. Billings has resigned as director of the Mica-Graphite Division, and has gone with the Union Carbide & Carbon Corp., Niagara Falls, N.Y.

PERSONAL NEWS

James Stuart Douglas, writing recently from Montreal to **W. P. Stuart,** of the "Prescott Evening Courier," gave some of the early history of the United Verde mine at Jerome, Ariz., incidentally linking the name of Winston Churchill with the name of that famous camp. Three claims involved, it seems, were bought in 1883 by the three Jerome brothers of New York. Of these, Leonard Jerome, the oldest, was Winston Churchill's maternal grandfather. It was during the period of the Jerome ownership that the town of Jerome got its name. Eventually, in 1887, the Jeromes sold out to W. A. Clark, of Butte. **Arthur Notman** sends this bit of information.

Sergeant James A. Neustaedter, graduate of the Missouri School of Mines, class of 1943, was in the employ of Republic Mining & Manufacturing Co. Bauxite, Ark., until his induction into the armed forces in March of this year.

Frank Cameron, a geologist for the Anaconda Copper Mining Co., has been in the Tri-State district looking over prospective exploration. **Frank Eichelberger,** of Spokane, a consulting mining and metallurgical engineer, also is spending several days in the Tri-State mining field.

Sir Joseph Ball has been chosen chairman of the Kwalin Mining Co., operating concessions in the Gold Coast Colony, West Africa.

J. H. Terrell has been made general manager of Hill 50 Gold Mine, N.L., at Mt. Magnet, Western Australia, succeeding **T. Peart.**

A. D. Bryant, formerly with the Cerro de Pasco Copper Corp., is now with the Standard Silica Corp. at 209 South LaSalle St., Chicago 4, Ill.

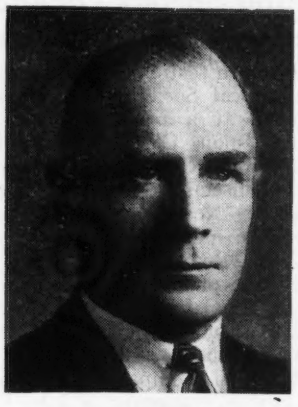
W. E. Sinclair has resigned from his position with the Cape Asbestos Co., Ltd., to join De Beers Consolidated Mines as technical assistant (mining) in Kimberley.

Thayer Lindsley has been elected president of Nipissing Mines Co., Ltd., in place of the late Alex. Fasken. Mr. Lindsley also retains his present office of vice president of the operating company, Nipissing Mining Co., Ltd. **Hugh Park** has been elected president of the operating company and vice president of Nipissing Mines Co., Ltd. **John S. Dickson,** of Dickson, Jolliffe & Co., Toronto, has been elected a director of both companies.

Fraser D. Reid has been elected president of McKenzie Red Lake Gold Mines, succeeding George Armstrong, deceased. **A. H. Sequin,** a director, succeeds Mr. Reid as vice president. **Dr. W. F. James** becomes a new director of the board of the company.

Max H. Barber, vice president in charge of operations of Cleveland-Cliffs Iron Co., will retire as of Dec. 31. He will make his future home at Hibbing, Minn.

J. L. Phelps has been appointed Minister of Natural Resources for the Province of Saskatchewan, in Canada,



J. L. PHELPS

which office embraces the administration of the Mines Department, at Regina.

J. H. Stovel has resigned as general manager of Dome Mines, Ltd., South Porcupine, Ont., but continues as vice president and managing director of the company and its subsidiaries. He is succeeded as general manager by **Robert E. Dye,** assistant manager for the past nine years.

Howland Bancroft has changed his address from Metals Reserve Co., 811 Vermont Ave., N. W., Washington, D. C., to 22 East 36th St., New York 16, N. Y.

Earl K. Nixon and associates of San Francisco have appointed **Eric H. Parr,** Vancouver, their British Columbia representative. Mr. Nixon and Mr. Parr are examining mineral deposits in the interior of the Province.

A. C. Melting, technical advisor to the mining division, WPB, Salt Lake City, who has taken work with American Smelting & Refining Co. in Nicaragua, has been succeeded by **A. M. Dixon,** formerly in a similar position in Portland, Ore.

John McKay, Bisbee, Ariz., has been made general manager of the "79" Lead-Copper Co.'s mine, with headquarters in Hayden, Ariz., succeeding the late George Welch.

Glenville A. Collins has returned to his offices at 803 Porter Building, Portland 4, Ore., having spent most of the summer on field investigations of dredge ground in the Cariboo of British Columbia, where preparations have been made for the installation of two new dredges next year for North American Goldfields, Ltd.

W. J. Asselstine has left British Columbia for British Guiana, where he will superintend mill enlargement at the property of Cuyuni Goldfields, Ltd

Morris F. LaCroix has been elected president of Copper Range Co., succeeding the late William H. Schacht. **P. F. Beaudin,** a vice president, was elected treasurer also.

Robert H. Carpenter, formerly of the staff of Anaconda Copper Mining Co., has been appointed mining geologist for International Smelting & Refining Co. of Salt Lake City.

Charles A. Anderson, senior geologist for the U.S. Geological Survey, is conducting an investigation of the Bagdad, Ariz., mining district to ascertain if copper mining operations in that area can be expanded. He is assisted by **E. A. Scholz** and **J. D. Strobell,** also of the U.S.G.S.

Grover J. Duff has been appointed general manager of the Eagle-Picher Mining & Smelting Co.'s Western operations, with headquarters in Tucson, Ariz.

W. R. Chedsey, consultant, Columbus, Ohio, has been appointed representative of A.I.M.E. on the Engineers' Council for Professional Development. **W. B. Plank,** head of the mining department, Lafayette College, Easton, Pa., will represent the Institute on the Executive Committee.

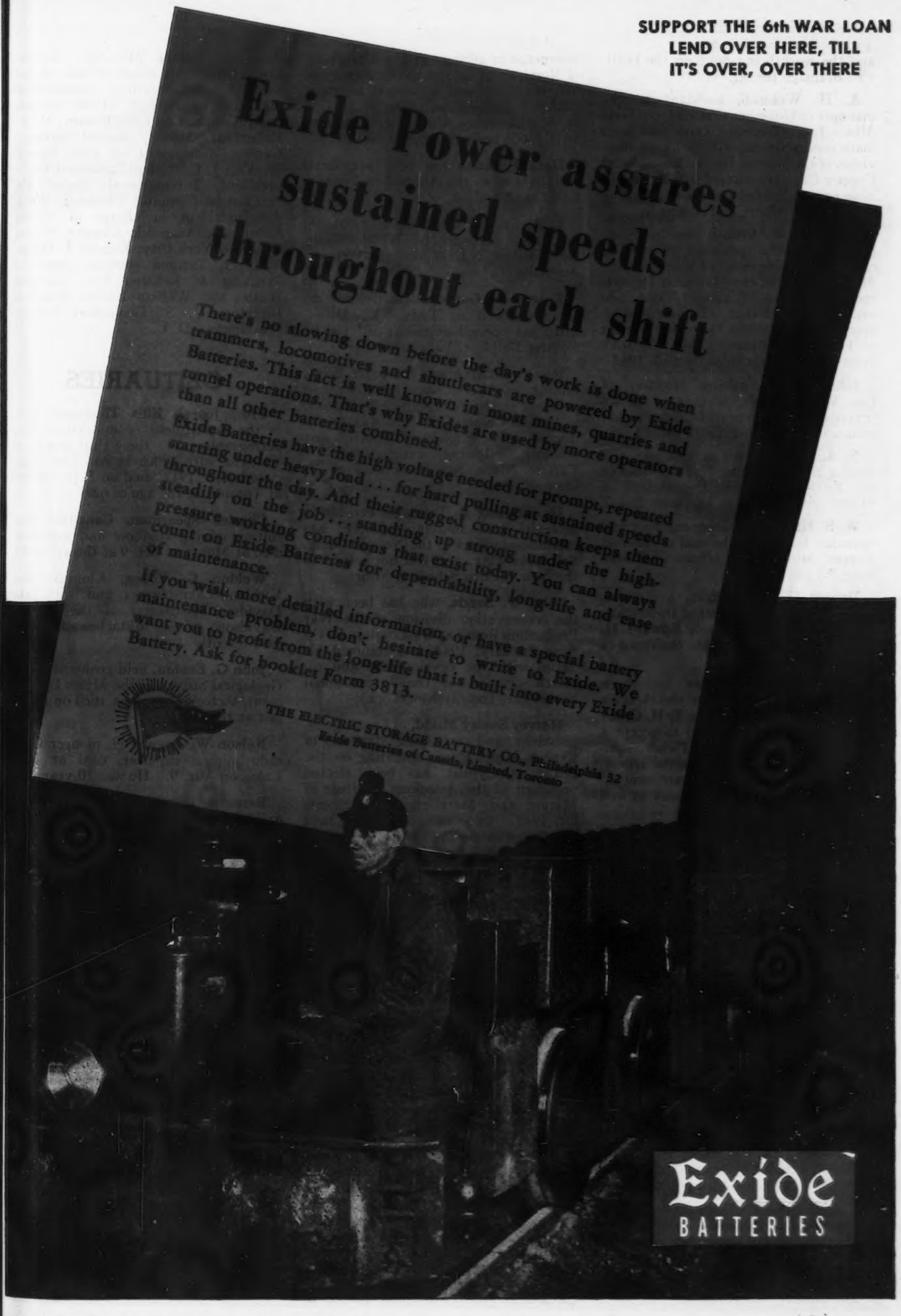
K. J. Cumming, who was on the staff of Austral Malay Tin, Ltd., in Malaya and more recently with the Australian Department of Munitions, has returned to Austral Malay Tin, Ltd., with headquarters at Sydney, New South Wales.

L. J. Weeks has been advanced from the position of assistant geologist to that of geologist on the staff of the Geological Survey of Canada.

L. H. Jeffries, of Deadwood, S. D., formerly mine superintendent of Canyon Corp., has left to enter the employ of Saudi Arabian Mining Syndicate, Ltd., whose mines are 200 miles northeast of Mecca, Arabia. It will take him 31 days to reach Jedda, on the Red Sea, whence he will go overland 200 miles to the syndicate's property to assume his duties as mine surveyor.

Worthen Bradley, president of Bradley Mining Co. and also president of the California chapter of the American Mining Congress, recently inspected the Leadville, Colo., mining district

SUPPORT THE 6th WAR LOAN
LEND OVER HERE, TILL
IT'S OVER, OVER THERE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THE ELECTRIC STORAGE BATTERY CO., Philadelphia 32
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BATTERIES

and the work being done on the Leadville drainage tunnel.

A. H. Wohlrab, assistant to the manager of Hollinger Consolidated Gold Mines Ltd., Timmins, Ont., has been made general manager of the Calumet division of Calumet & Hecla Consolidated Copper Co. He succeeds **E. R. Lovell,** who was appointed president following the death of Albert E. Petermann.

Leslie G. R. Crouch has been appointed to the position of mining engineer and inspector of mines for the Mines Branch of the Manitoba Department of Mines, Winnipeg, Man., to succeed **W. B. Paton,** who accepted an appointment with the Dominion Bureau of Explosives, Ottawa. Mr. Crouch's appointment dates from Oct. 10, 1944.

John Edwin, mining engineer of Las Vegas, N.M., is engaged in an investigation in Venezuela and will not return to this country until early 1945.

N. A. Herridge has resigned as submining recorder of the Nakusp office of the British Columbia Department of Mines, and that office has been closed.

W. S. Harrison, mining engineer and operator, has joined the staff of Atwood Copper Mines, with offices at Lordsburg, N. M.

Donald H. McLaughlin, a director, has been elected president of Homestake Mining Co. He succeeds **Edward H. Clark,** who has been made chairman of the board.

George H. Roseveare has been appointed metallurgist for the Arizona Bureau of Mines, replacing **E. H. Crabtree, Jr.,** who has resigned to accept a position with the Eagle-Picher company's mines in the Sahuarita region, south of Tucson. Roseveare will do ore testing work for the Bureau as well as metallurgical research.

R. H. Zeglin, general mining superintendent for Reynolds Mining Corporation at Little Rock, Ark., advises us that in the article published on pp. 82-84 of the October issue of *E.&M.J.*, describing the company's shuttle car practice, appreciation should have been expressed particularly to H. T. Middlebrook, superintendent of underground mines, and C. Lester Richards, chief mining engineer, both of Bauxite, Ark., for their cooperation in supplying data.

Kenneth L. Cochran, until recently with the Zinc Division of the War Production Board, is now employed as chief geologist by the Baroid Sales Division of the National Lead Co. at Malvern, Ark.

W. Baragwanath, director of Geological Survey, in the Department of Mines, Victoria, Australia, has retired from the service, but will continue to act in a consulting capacity.

Harold L. Johnson was recently appointed safety engineer for the Demerara Bauxite Co., in British Guiana.

Dr. Robert Oliver Bloomer, former instructor in geology at the University of North Carolina and the University of Virginia, has been appointed assistant professor in the department of geology at St. Lawrence University, Canton, N. Y., and began his duties Nov. 1.

Dara P. Antia has been appointed metallurgist to the Aluminum Production Co. of India.

L. A. Crozier has been made assistant mine manager of Wattle Gully Gold Mines, N.L., Chewton, Victoria, Australia.

Robert B. Gayer, formerly general superintendent of Twin "J" Mines, Ltd., has opened offices at 305 Credit Foncier Building, Vancouver.

Robert McAfee and **LaMonte West,** mining engineers, have been sent to prospect in the Whitesail Lake district, in British Columbia, where spectacular discoveries of gold were reported last summer, following investigations by Earl K. Nixon, San Francisco consulting engineer.

Dr. Sterling B. Talmage, consulting geologist and mining engineer, has established offices in the Ness Building, Salt Lake City, and will not return to the New Mexico School of Mines.

John W. Sands, who has been with the conservation division of the War Production Board at Washington, D. C., since January, 1942, has resumed his duties with the development and research division of the International Nickel Co., Inc., at New York.

Harvey Seeley Mudd, of Los Angeles, president and managing director of Cyprus Mines Corp. operating on the Island of Cyprus, has been elected president of the American Institute of Mining and Metallurgical Engineers for 1945. Two vice presidents have also been chosen: Donald H. McLaughlin, vice president and general manager, Cerro de Pasco Copper Corp., New York City; and Leo F. Reinartz, manager of the Middletown Division, American Rolling Mill Co., Middletown, Ohio. Six directors also elected were: C. H. Benedict, metallurgical manager, Calumet & Hecla Consolidated Copper Co., Lake Linden, Mich.; Robert H. Morris, general manager, Gauley Mountain Coal Co., Ansted, W. Va.; J. C. Nicholls, assistant to the president, International Nickel Co. of Canada, Toronto; Clyde E. Weed, vice president in charge of mining operations, Anaconda Copper Mining Co., New York City; Eugene A. White, manager, Tacoma smelter, American Smelting & Refining Co., Tacoma, Wash.; and William Embry Wrather, Director, U. S. Geological Survey, Washington, D. C.

1944 Index for E.&M.J.

Readers who desire a copy of the Index for the current volume of E.&M.J., which closes with the December number, are requested to send their names and addresses to the Editorial Department, Engineering and Mining Journal, 330 West 42nd St., New York 18, N.Y. Owing to the shortage of paper, the Index is being printed separately and will be sent only to those who ask for it. It is now in course of preparation.

OBITUARIES

Prof. Joseph Ellis Thomson, head of the department of mineralogy and petrography at the University of Toronto, with which he had been associated since 1912, died on Sept. 26 last at Toronto at the age of 62.

Charles Spearman, Canadian consulting mining engineer and geologist, died at Montreal Oct. 9 at the age of 63.

Weldon C. Young, Klondike and Kirkland Lake pioneer, and, with Jake Davidson, discoverer of the Young-Davidson mine, Matachewan, Ont., died recently.

John G. Easton, field geologist in the Geological Survey of the Mines Department, Victoria, Australia, died on Aug. 9 last at the age of 60.

Nelson W. Logue, 69, pioneer Colorado mining engineer, died at Ray, Colo., on Aug. 9. He was 70 years old.

Bernard Cunniff, mining engineer and a pioneer in the development of magnesium in the United States, died in Cambridge, Mass., on Nov. 9 at the age of 66.

John L. Alves, 69, American mining man who had worked in western Mexico for some 40 years, was killed by burglars recently while in bed at his home in Colima City, Colima, Mexico, police of that town reported.

Henry S. Sanderson, prominent Colorado mining man and president of North American Mining Co., died in September last. He was an active member of the Colorado Mining Association and one of the oldest mineral surveyors of Colorado.

T. R. Hunt, former mill superintendent for the Shenandoah Dives mill, north of Silverton, Colo., died recently at Monrovia, Calif.

Dr. Beram D. Saklatwalla, 63, consulting metallurgist, former senior vice president and research director of the Vanadium Corporation of America, was killed in an airplane accident at Hanford, Calif., on Nov. 4. He was born in Bombay, India, and was edu-

Illustrated: Moly Closed-Back Muckers Shovel—with Arrow Point, and with Steel I-Beam Handle Reinforcement.

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cated at the University of Bombay and Royal Polytechnic Institute, Charlottenburg, Germany. In 1909 he came to the United States and joined the American Vanadium Co., of Pittsburgh. In 1910 he was made general superintendent of the Vanadium Corporation of America, and ten years later became vice president. During his career more than 180 American and foreign patents were granted to him.

George Smith, a noted authority on Australian mineralogy, died at Sydney recently. In his early career he managed the New Australian Broken Hill Consols mine, at Broken Hill, where he studied and described the many rare minerals which occurred in that lode. Later he was an inspector of mines in New South Wales.

W. H. Visser, who was the representative of the Chamber of Mines in Capetown, died recently at the age of 67. Born in Capetown, he graduated in mining from the old South African School of Mines at Kimberley. He was the chief surveyor of the Johannesburg Consolidated Investment Co. for a number of years and resigned from the group in 1937 to take up his appointment with the Chamber of Mines.

Donald S. McDonald, 78 year old retired mining man, passed away at his home in Globe, Ariz., on Oct. 13. McDonald was one time owner of the famous Apache mine, in Gila County, a vanadium property.

Herbert F. Brown, mine foreman for the American Smelting & Refining Company plant at Morenci, Ariz., for the past eight years, and who had previously worked with the firm at Bisbee and Tucson, Ariz., died in Morenci, Ariz., on Oct. 14.

James A. Foley, 66, a director of Silver King Coalition Mines Co. and who had been connected with many western mining enterprises, died Nov. 3 in Salt Lake City.

Stanley F. Kimball, 58, former mine owner and promoter in Arizona, died in Salt Lake City Nov. 7 after a brief illness.

Thomas Finley McBride, general manager of Metalurgica de Mexico, S. A., Tlalnepantla, Mexico, D. F., died in that city on Nov. 4. Mr. McBride was a graduate of the Montana School of Mines in the class of 1932, and was for many years connected with American Smelting & Refining Co. as a metallurgical engineer.

LETTERS

New Wealth Necessary

The Editor:

AFTER THE PRESENT WAR the nation will be faced with an unemployment problem the like of which never has been seen, unless steps are taken to increase the production of new wealth in greater quantities than ever before. Along with this there must be a better and more equitable distribution of the new wealth created.

With the nation carrying the enormous public debt upon which interest must be paid, with business and industry burdened down with an overload of taxes, it is certain that unless this new wealth is produced a depression of greater extent than ever has been known must ensue.

The building of new roads, the construction of new levies along the rivers, the building of more public buildings, the dredging of harbors and like projects will in a measure tend to relieve unemployment, but will not supply the increased national income so necessary for national prosperity. If the national income falls back to the average level of the thirties it will necessitate a rise in taxes that will be beyond the ability of business and industry to carry. It will be a dark picture that will face industry in America.

A flood of new wealth, produced by American labor within the United States, would increase the national income to the extent that the taxes thereon would be sufficient to justify a reduction in the present rate.

The United States has five basic wealth-producing industries: mining, agriculture, livestock raising, lumbering, and fishing. Upon these all others depend for their existence. Each may be divided into several branches, however, and each of the branches will retain the same relation to the national income. Each will produce new wealth to add to the national income.

Just after the Civil War the prosperity of the nation was saved by the flood of gold and silver from the mines of Nevada, California, Colorado, and Montana. Most of that credit goes to the famous Comstock lode, Virginia City, Nev. The money panic in the nineties that brought disaster and ruin to industry and business was alleviated by the gold from the Klondike, Alaska, and Cripple Creek, Colo. It has been such floods of new wealth from the basic industries that have cured the many depressions in the past, and under our present economic system will be necessary to avoid, prevent, or cure in the future. The depression in the thirties, however, was not cured by the production of new wealth. Instead, the economy of scarcity was brought into play, and instead of producing more new wealth, this was discouraged and reduced in many ways. The result was that the depression was still with the country until the war's demands brought about the change. Prosperity cannot be brought by destroying property where it be the product of the farms, the mines, the forests, the ranges, or the waters.

The nation owes it to its brave defenders to return them to a country alive with prosperity, with opportunity and jobs for all, and to do this there must be the highest possible production of new wealth in all of the basic industries, which will mean that all of the other forms of industry and business resting upon these basic ones will also be busy and prosperous. Each and every one of the five industries working full time, there will be ample purchasing power to keep all others busy and prosperous.

J. E. RUSSELL

Phoenix, Ariz.

A Letter in Verse

LAMENT OF A MINING ENGINEER'S WIFE IN THE TROPICS.

You'll never guess just what a mess
This camp of ours so bleak.
There's lots of work that one can't shirk.
Eight days out of the week

The boys don't mix, they're full of kicks
About the way things run.
They fret, they stew, as men will do,
And so we have no fun.

We have a beach that is a beach.
There's just one thing we fear:
The nick-nicks bite 'till late at night
So bad we can't go near.

Because of the pump down in the sump
And the mill upon the hill
Our plans at night seldom go right
And probably never will.

We plan to go to see a show—
Perhaps the car breaks down:
The direction! we should have known—
So we don't go to town.

Our hair is long or cut all wrong.
All style we've left behind.
We've reached the point in this damn joint
Where we don't seem to mind.

A carabao, he takes for chow
The gardens which we prize.
The fruit he skips the native snips
Before our very eyes.

Millions of bugs chew on our rugs,
Termites gnaw at the floor.
Cockroaches fly, not a bit shy,
And ants we have galore.

The rocky road to our abode
Our friends will not attempt.
It's rough they say—too long a way;
They view it with contempt.

Full half the year the rains appear;
We see the sun no more.
Thick mold collects on our effects
And mud upon our floor.

Men come and go every week or so
And some stay on a year.
A few *were* sane, but they became
Before they left, quite queer.

Our nerves are shot, we fret a lot,
We curse this deadly pace.
Home we return to sadly learn
We're homesick for the place.

My story ends and I contend
When all is said and done,
We will forget hardships we met—
Our camp was sort of fun.

L. H. AND W. F.

THE Iron and Steel Industry is setting its sights on a new target—*lower production costs.*

This postwar objective of the industry will put special emphasis on proper treatment of raw materials—both ore and coal. Modern facilities for crushing, screening, concentrating, blending and sintering will become essential to low cost production.

McKee experience in the design and construction of ore treating plants and our thorough knowledge of iron and steel production requirements make the service of this organization particularly valuable in helping you attain this new objective.

The McKee organization, which participated so extensively in the Iron and Steel Industry's expansion program for maximum production, will bring all its broad experience to bear in providing facilities for efficient, economical preparation of raw materials.

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REGIONAL NEWS

NEVADA

Postwar placer mining in Nevada planned by Natomas Co.—Mt. Hope zinc mill starts

★Metallurgists in charge of the U. S. Bureau of Mines electrolytic manganese test plant at Boulder City, Nev., state that capacity has been increased to 2,000 lb. per day of metallic manganese 99.9 per cent-plus pure, employing a process perfected by Bureau technicians at this plant and treating low-grade ore. A complete report on the project is contained in the USBM publication, RI-3681, "Manganese Investigations—No. 19," which may be obtained free from the Bureau's offices at Washington, 25, D.C.

★At the Mount Hope mine, in Eureka County, a selective-flotation mill was scheduled to begin crushing ore early in December, treating zinc-lead-cadmium ore. Held under lease from a subsidiary of U. S. Steel, the mine is operated by the Callahan Zinc-Lead Co., which has moved mill equipment from its Duquesne unit near Nogales, Ariz. A construction contract was awarded the Western-Knapp Engineering Co. Karl Kedzie Hood, formerly in charge for Callahan at Nogales, has been transferred to the Mount Hope mine as manager.

★Deep diamond drilling is in progress on property of the Mountain City Consolidated Copper Co., in the Cope or Mountain City district, northern Elko County, adjoining on the west the productive Rio Tinto mine of the Anaconda-controlled Mountain City Copper Co. and covering a long stretch of the gossan-capped, fractured, and highly silicified copper belt, over 1,500 ft. wide in places. Surface stripping with bulldozer exposed three parallel ore-channels, and the first drill hole at 500 ft. had reached the water table and sulphide zone, cores showing many particles of native copper. Several deep holes are to be drilled by the Mitchell Diamond Drill Co., of San Francisco, which has the contract, as a step preliminary to sinking a deep main shaft. George B. Thatcher, Reno, is president, and M. E. Bohannan, Rio Tinto, mine manager.

★Hall Brothers, trucking contractors of Ely, who had been shipping a substantial volume of zinc-lead ore from the old Tybo mine, in Nye County, leased from the Treadwell Yukon Co., Ltd., have entered into a contract to deliver to the Selby smelter of A.S.&R. 1,000 tons monthly of slag from the old Tybo smelter, operated in the early twenties by the Louisiana Consolidated Mining Co., of New York. Test shipments of 108 tons of the slag, nearly pure silica, sampled around $9 per ton in lead and zinc. The product is trucked 70 miles to the rail point at Tonopah. Roy Redenbaugh, of Tonopah, is in charge.

THE HOTTEST SPOT in the Canadian Northwest, according to informed sources, is occupied by this unassuming headframe of Giant Yellowknife Gold Mines, Ltd., NWT, where a recent discovery of a large low grade gold orebody started a minor gold rush to the Great Bear Lake region. The company now plans to raise about $1,500,000 for development, including two shafts.

★The Black Rock manganese mine and 100-ton concentrator of Western Alloys, Inc., south of Valmy, in southeastern Humboldt County, have been closed down and equipment has been offered for sale. Shortage of water for the plant and trouble in meeting new Metals Reserve specifications contributed to the wind-up of the enterprise, headed by P. A. Mattingly, of Salt Lake City. Concentrate was shipped for a time to the Columbia Steel plant in Utah.

★Construction of a tungsten concentrator of substantial capacity is reported in progress at the Riley scheelite mine of the Northern Nevada Mining Co., in the Potosi district of Humboldt County, near the Getchell mine and the Potosi scheelite stockpile, said to be the largest in the country, containing some 80,000 tons produced chiefly from the Riley mine. Joseph E. Riley, Reno, is chief owner of three partners and manager of the project. Equipment of a closed tungsten plant near Bishop, Calif., and other units acquired from the closed Pershing Quicksilver Co. mine, in Nevada, have been moved to the Potosi property, where T. S. Davey is superintendent.

★More than 360 cars, 60 to 70 tons per carload, had been shipped at mid-November to the Garfield smelter of A.S.&R. from the Greenan-Kerr copper-tin mine at Majuba Hill, Pershing County. At the horizon of current production, on the "middle" tunnel level, the product is mingled oxide and sulphide. Recent deeper drilling by the U. S. Bureau of Mines and by the Greenan management was said to have penetrated solid sulphide ore less than 100 ft. below producing stopes. Deeper sinking is planned with a view to construction of a concentrator.

★Production of talc has increased substantially in the old Palmetto silver-gold district in Esmeralda County near the California line. The crude product is trucked to a narrow-gage railroad point at Zurich, Calif. Output from this area has reached such proportions that the OPA has placed specific price ceilings on the district product, ranging from $15.25 per short ton for "No. 1 selected cosmetic talc" down to $8 for No. 4 "blue filler" talc. Federal reports indicate the district is the foremost producer of highest-quality talc.

★The Natomas Co., second-ranking U.S. operator of gold dredges, is prepared when the "green light" is given gold mining to proceed with a gold-dredging operation surpassing in scope any undertaken in Nevada, where vast reaches of arid desert have discouraged the placer miner because of the absence of surface water to wash his gravel. Natomas has under lease and option the Greenan Placers Co. property, embracing alluvial fans and broad gulch

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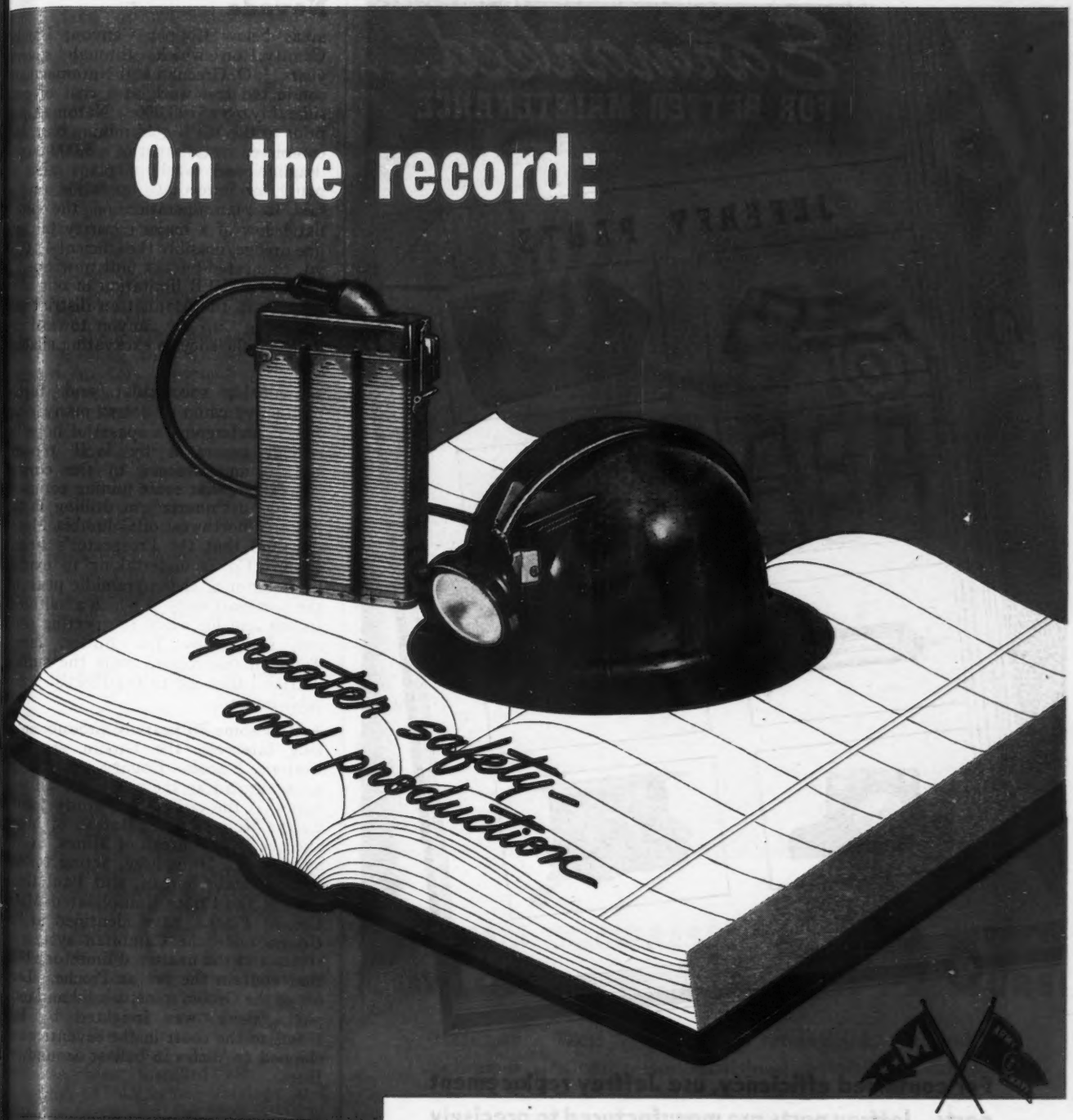

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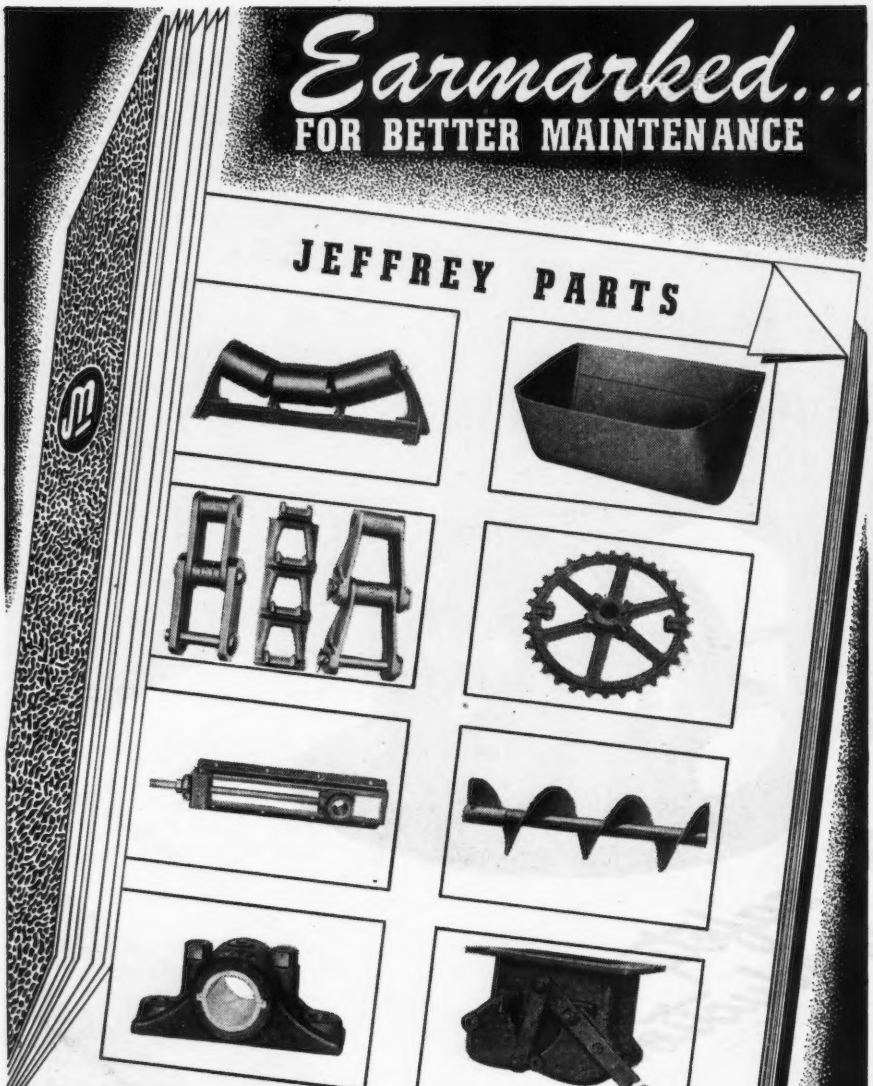

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Nevada (*continued*)

areas below Copper Canyon, Lander County, on which, through several years, J. O. Greenan and Natomas have conducted test work at a cost of considerably over $100,000. Natomas, just prior to the WPB gold mining ban, had completed installation of a 5,000-cu.yd. dragline and washing plant that is ready for immediate operation and is said to plan operation on the broad flat below of a major-capacity bucket-line dredge, possibly the efficient 12,000-yd. connected-bucket unit now operating under WPB limitation of one shift per day in the Manhattan district and "working" up the canyon toward the limit of efficiency in excavating shallow gravel.

★Goldfield, spectacular and highly productive camp of not so many years ago, is undergoing a spasm of hope for revival generated by local reports, strange and obscure to the current generation, that some mining company has found "quartz" in drilling in the flat area northwest of Columbia Mountain and that the Prospector's Friend Mining Co. is undertaking to explore the interior of that pyramidic peak, on the northeast slope of which a halfbreed Indian and his white prospecting partner, staked by Jim Butler, famed Tonopah discoverer, made the surface "strike" that led to Goldfield's memorable boom.

★After some 70 years of production at long intervals, the Groom mine, in western Lincoln County, known to miner legend as the richest of all lead mines, is the object of a study jointly by the Nevada State Bureau of Mines and the U. S. Bureau of Mines. Geologists F. L. Humphrey, acting for the Nevada state bureau, and Paul Gemmill, of the Prince Consolidated Mines Co., at Pioche, have identified at the Groom mine the Cambrian system of strata and the unaltered limestone beds that contain the ore at Pioche. Lead ore of the Groom mine, a solid and compact galena, was freighted by bull teams to the coast in the seventies and shipped to Wales in ballast around the Horn.

CALIFORNIA

Mining Society forms Western section—U. S. Vanadium stops Pine Creek operation

★A small crew is at work developing the Brush Creek gold mine, near Goodyear's Bar, in Sierra County, leased recently by Alfred L. Merritt, of San Francisco, from Fred Cassidy, Nevada City mine operator. The mine is equipped with a small stamp mill capable of handling about 100 tons of ore a month. Activities will be increased as soon as the ban on gold mining is lifted.

★Production of manganese continues in the Mad River area of Trinity

County, and output is being rushed to market before the MRC restrictions become effective on Jan. 1, 1945. Western States Metals Mining Co. is shipping a substantial amount of ore from its Hale Creek property, with C. Snyder, superintendent, in charge, and J. P. Warren is producing commercial ore from the Blue Jay group of claims. Operators doubt that many manganese mines will be able to operate under the new MRC restrictions.

★A Western section of the Mining and Metallurgical Society of America was organized at a meeting held at the Pacific Union Club in San Francisco on Nov. 3. The meeting was arranged by D. C. Jackling and William Wallace Mein, counselors representing northern California, Nevada, and Alaska. Thomas T. Read, permanent secretary of the society, with headquarters in New York, assisted them. Charles White Merrill, supervising engineer, U. S. Bureau of Mines, San Francisco, was appointed secretary-treasurer of the newly formed section.

★Plymouth Rock Wool Manufacturing Co., controlled by W. H. Danzer and associates, is producing rock wool from slag left by former operators of the Detert copper mine, near Plymouth, Amador County, the finished product being shipped to manufacturers of building materials. Its chief use is for insulating purposes. The company some months ago leased the steam plant and several buildings at the Pacific gold mine from Argonaut Mining Co.

★Steady operations are reported from the Chaboya quicksilver mine, near San Jose, Santa Clara County, following completion of a 20-ton rotary furnace plant. Furnace feed includes both ore mined underground and dump material. Dick Perinoni, superintendent, is in charge of operations.

★Rehabilitation work is progressing satisfactorily at the Gruss mine, in the Genesee district of Plumas County, leased recently by Sierra Mines, Inc., with A. E. Blackner and C. H. Dampf directing operations. Mining machinery has been installed and reconditioning of old mine workings and openings preparatory to resumption of exploratory activities is in progress. The property at one time was equipped with a 150-ton concentrator handling copper ore with some gold and silver.

★According to a communication from Bishop, Inyo County, United States Vanadium Corp. has suspended mining operations at its tungsten property at Pine Creek, and is operating the concentrator on custom ores. Underground development work continues, including driving of a lower tunnel under contract by Morrison-Knudsen Co. M. N. Shaw directs operations.

★Reopening of the old Morgan asbestos mine, at Dutch Flat, Placer County, is being undertaken by R. J. Bushfield and E. Rose, associated with R. F. Northwing and J. G. Rankin, of San Francisco. The work is done under a lease from Thomas J. Acheson.

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UTAH

Labor force drops steadily in Utah mines—Shift differentials approved—Kalunite continues

★A steady deterioration in labor supply was experienced by 18 major mining and smelting companies of Utah during the 12 months ending Oct. 1, A. G. Mackenzie, manager, Utah Metal Mine Operators' Assn., reports. The figures, he said, are only for workers paid by the day. These 18 major enterprises, according to War Manpower Commission data, represent approximately 90 percent of all such mine, mill, and smelter work done within the state.

As of the first of each month, the figures are:

Month	On Pay-roll	At Work	Number Short	Percent of Absentees
November (1943)	9,650	8,950	1,153	....
December	9,884	9,207	849	....
January (1944)	9,973	9,121	895	....
February	9,910	9,072	921	7.19
March	9,806	9,130	965	7.12
April	9,499	8,890	1,239	6.30
May	9,172	8,642	1,556	6.31
June	8,902	8,257	1,661	7.02
July	8,643	8,201	1,697	6.60
August	8,484	7,894	1,843	6.87
September	8,366	7,822	1,920	5.97
October	8,084	7,600	2,216	6.97

Of the absenteeism reported as of Oct. 1, 1944, 6.97 percent, 4.57 percent was without reported cause.

★Many Utah mining and smelting concerns now are issuing wage payments to workers retroactive to June 30, 1943, which were awarded them by the National War Labor Board and approved by Economic Stabilization Director Fred M. Vinson. The new wage differential also becomes effective for the 1944 contract period which began last July 1. Vinson approved the differentials providing for 4¢. an hour for working the second shift, 8¢. for the third shift, and 6¢. for working a second shift in mines where the two tricks are divided by an interval for airing the workings. Many months ago the Non-ferrous Metals Commission awarded workers 25¢. per shift increase in wages on grounds that each worker theoretically shared in the inconvenience of working night shifts. Both operators and representatives of the International Mine, Mill & Smelter Workers appealed this to NWLB. The decision grants increases only to workers who actually work the less convenient shifts.

★Shift differentials providing compensation for night work for 1,710 employes of Utah Copper Co. at Bingham were announced Oct. 28 by Chairman J. Glenn Donaldson of the Non-ferrous Metals Commission of the National War Labor Board. Employes will be paid an additional 4¢. an hour on second shifts, 6¢. an hour on intermediate shifts, and 8¢. an hour on third shifts. Requests of MMSW for a military service clause in the contract and for elimination of the $6.15 rate for various classifications in the track department were denied.

★The Nonferrous Metals Commission

on Nov. 7 announced granting of standard, voluntary maintenance of union membership to clerical and technical employes of United States Smelting, Refining & Mining Co. at Midvale. F. S. Mulock, company vice president and general manager of Western operations, said the maintenance of union membership was a disputed point in a contract signed by the company last March with Midvale Technical Workers' union, an affiliate of MMSW.

★Federal District Judge Tillman D. Johnson ruled on Oct. 30 that the Utah State Tax Commission was in error in construing State laws governing payment of mine taxes. He held that federal premium payments on over-quota production of metal mines should not be used in figuring net proceeds of the previous year, used in calculating the assessed valuation for the present year, nor in computing gross proceeds, used in figuring the mine occupation tax. The judge ordered that the tax commission refund $37,814.22, plus interest at 6 percent from May 31, to Kennecott Copper Co., and $4,533.54 plus interest at 6 percent from July 29, to Silver King Coalition Mines Co., Park City. Provided the Tax Commission does not decide to appeal the case, Judge Johnson's decision will mean an immediate reduction of about $296,000 in mining taxes paid the State this year, according to Milton Twitchell, member of the State Tax Commission. Just in case the Tax Commission should appeal the case, New Park Mining Co., Park City, filed suit Nov. 9 in federal court asking for refund of $3,763.48 which it has paid under protest to the State Tax Commission. This suit is filed to protect the company in case an appeal slows down final decision and makes the claim subject to forfeit because of the delay.

★The Kalunite, Inc., $5,000,000 alumina plant near Salt Lake City, which has been operating more than a year, will continue its experimental program indefinitely, WPB officials announced during an inspection trip here late in October. "Although we have plenty of aluminum and alumina for our war program for the present, we intend to continue the experimental program at the plant to full completion," said George C. Heikes, Washington, D.C., director, aluminum-magnesium division, WPB, in Salt Lake City. With Mr. Heikes were James L. Head, chief, raw materials branch, aluminum-magnesium division, WPB; Dr. R. L. Sebastian, consulting engineer of the division, and B. L. Crenshaw, regional engineer, Defense Plant Corp. They conferred with J. S. Elfred Jr., general manager, Kalunite, Inc. The Kalunite plant processes alunite mined near Marysvale, Utah, and the resultant alumina is sent to Tacoma, Wash., for conversion into aluminum. Mr. Heikes, a former Salt Laker, said the Kalunite plant is running smoothly and improving every day. The plant is being operated 24 hours a day and employing approximately 100 workers on three shifts.

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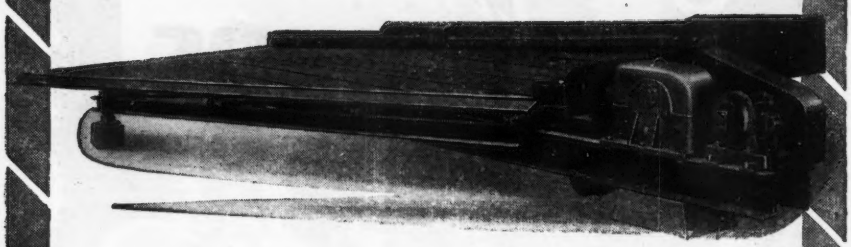

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Utah (*continued*)

tinue in the United States for three to four years after the war with anticipated stockpiling of the red metal, E. T. Stannard, New York City, president of Kennecott Copper Corp., parent company of Utah Copper Co., said during an inspection trip to Salt Lake City early in November. Mr. Stannard estimated that 60 to 70 percent of present domestic copper production could be used by the electrical and automobile industries in peacetime and that 50,000 tons of copper annually will go into the steel and cast-iron industries. He said Kennecott's domestic production of copper is down approximately 25 percent compared with last year's record production. The decline is due to manpower shortage, he said. Strenuous efforts now are being made to hire agricultural workers during the winter months.

COLORADO

Leadville Tunnel hits better going—Bradley Mining Co. to run Gold King mine, at Ouray

★The Leadville Tunnel, according to a recent Associated Press dispatch, has now been driven successfully past the point where trouble was encountered last July, when at a distance of 2,185 ft. in from the portal a rush of loose muck and water filled 300 ft. of the bore. The caved ground was bulkheaded off, much water was drained from the area, and a turn-out was driven parallel to the original tunnel. This turn-out is now approaching the 3,000-ft. mark, having successfully passed the loose ground that caused the first cave-in. Progress has thus far been slow owing to the difficult ground conditions encountered and because of labor shortages, but better speed will be made as soon as the tunnel gets into solid rock and concreting and close timbering can be dispensed with. The tunnel will have a maximum length of about 22,000 ft., and it is hoped that it will help rehabilitate the Leadville district by draining orebodies thus far inaccessible because of excessive pumping costs. The tunnel was projected as a war measure to add to the Nation's store of lead and zinc. It is a U. S. Bureau of Mines project, but the job is worked under contract with Stiers Brothers Construction Co., John Austin in charge.

★The vermiculite property of 500 acres at Encampment, Wyo., which has been operated by C. A. Luellen, of Denver, and Fred Roeder, of Berthoud, has been leased to the Vermiculite Co., Inc., of Los Angeles. Charles L. Nichols is president. The Colorado operators of the property have been shipping about 100 tons weekly for some time. The new company is installing new machinery, including a RD8 bulldozer to remove the overburden and a drilling machine to test the ore to 100-ft. depth.

★Union Carbide Co. has opened the Kirk mine, on Quartz Hill, near Central City, and expects to do considerable work, as the mine has not been operated for many years, yet has a record of having produced much high-grade ore.

★The Lost Day and Columbine mining claims above Ironton are being worked with a bulldozer. Five cars of this rich silver-, zinc-, lead ore have already been shipped by Earl Alexander and James Braden; and they showed profitable returns. The vein lies along the surface and shows values wherever it has been exposed and sampled: and it will be impossible to carry on surface work when snow comes.

★Joseph M. Bradley, general manager of the Highland Mary Mines, Inc., recently stated that the new machinery in the mill should be in operation in November.

★George Beardsley, operating the Lady Franklin mine, near Silver Cliff, has shipped a carload of lead, zinc, and silver ore to the Golden Cycle mill. The new company has just installed a new hoist and compressor together with mining equipment and buildings. Edward F. Stacy, of Silver Cliff, mine foreman, states a new shaft is being sunk and will be taken down to the 247-ft. level.

★T. W. Brock reports that the U.S. Vanadium Corp. plant at Durango will be reopened. This plant ceased operations last February, and it will now be operated as a direct subsidiary of the New York corporation and no government agency will be involved. Tom Brock is general superintendent, W. F. Moore, chief accountant and head of the office force, and John Kelly, mill superintendent. The plant will remain as agent for the acid leach plant for the government which has continued production uninterruptedly following government shutdown of the auxiliary unit. Resumption of the vanadium plant means employment to about 50 men.

★One of the most important events in Colorado's mining history is the entrance into Colorado of the Bradley Mining Co. The Bradleys, long associated with Alaska Juneau and Bunker Hill & Sullivan, have taken over the Gold King mine and property near Ouray, and will start extensive operations as soon as supplies are available, workers secured, and WPB order L-208 is rescinded. The Gold King property has been held under option by Earl Crowell, of Lawton, Iowa, who has transferred his title to the new company. The Gold King group is located at Gladstone, near Silverton, in San Juan County, and comprises about 150 acres and six other claims totaling 55 acres between the Gold King group and the Sunnyside mine. Included with this is the Gold King Mill and tramway. The property is developed by a 700-ft. shaft and a 3,000-ft. tunnel, with the west vein opened on the 700-ft. level. The Gold King is traversed by fissure veins in andesite carrying irregular stringers of lead-copper ore with gold and silver. Gold occurs free in white quartz asso-

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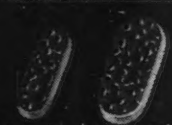

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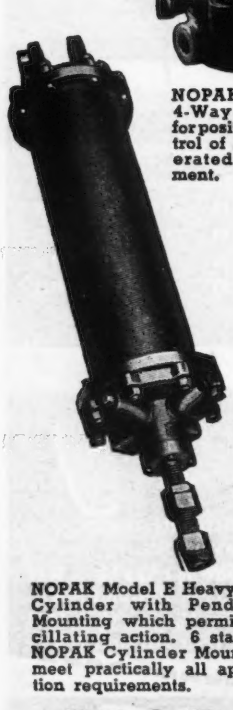

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Colorado (*continued*)

ciated with iron pyrite, galena, or blende. This property is credited with over $6,000,000 net from 1895 to 1919, and paid $1,750,000 dividends.

★A number of improvements have been completed by the Pennsylvania Gold & Silver Mines, Inc., at its Shoe Basin mine, at the foot of Argentine Mountain, near Montezuma. Over 1,500 tons of mill-grade zinc-copper-lead ore have been stockpiled since work was started last winter. Fleury and associates of Chicago, operating the property, have installed a new compressor and built a new compressor house, snowsheds, and other buildings. Oscar Fischer, of Denver, is engineer for the company's operations and Bill Barton, of Montezuma, is mine superintendent.

★Dr. A. P. Preston, operating the old Stevens property, near Silver Plume, has had the road to the main highway put in condition for winter. Stopes and raises have been run to the 12th and 13th levels, where it is stated that some good zinc-lead-silver ore has been opened at the junction of the Stevens and the Mayflower veins. The ore is being developed for shipping.

★Western Colorado Power Co. is constructing a new power line from Ouray to Red Mountain, and reconstructing the power line for higher voltage from Red Mountain to Silverton. This will eliminate the section that has been carrying the service over the range to the King Lease at Camp Bird and thence to the city. This line through Camp Bird goes through very hard country where snowslides may interfere with power delivery, as was the case last winter when the whole upper section of the Uncompahgre was without service for a time.

★Harry Wells and Fred Kublin, of St. Louis, who have taken over the Embargo Tornado mine, in the Embargo district of the San Luis valley near Durango, plan to drive an old tunnel to greater depths to open up an orebody of silver-gold ore.

★United Production Corp., of Denver, headed by Willard Bascom, purchased the Lackawanna mine and mill across Animas Fork from Silverton about 16 months ago. Mill capacity will be increased to 125 tons daily, and selective flotation will recover zinc and lead. This company has also opened the Burrows mine, at Animas Fork, and the Caledonian mine, and it has a lease on the rich Scranton City vein, where a mill is being erected. Scott Kipping is in charge of the mill installation work at the Lackawanna mill; R. E. Wilcoxon, of Pueblo, is president of United Production Corp.; Frank C. Myers, of Denver, is secretary-treasurer, with offices at 510 in the C. A. Johnson Building, Denver, Colo.

★A fire has destroyed the San Juan mine property of O. Barlow Willmarth in West Argentine near Georgetown. This property has been a producer of high-grade lead ore.

SOUTH DAKOTA

Fluorspar developed at Hoosier mine—USBM samples Carbonate gold, silver, lead mines

The mines and mill of Belle Eldridge Gold Mines, Inc., are located in Spruce Gulch, two miles south and east of Deadwood. Shortly after the start of the war in December, 1941, a complete 50-ton flotation plant was installed to recover the lead and zinc values of the ore found on the Helen Gould and adjacent claims of the Belle Eldridge group. Milling began on March 12, 1942, and continued until December, 1943, when the mill closed down and development work has been carried on in the mine to date. About 700 ft. of drift has been driven and about 3,000 ft. of diamond drilling done, five 500-ft. holes were drilled vertically to reach the quartzite, and this development work has disclosed quite a tonnage of lead and zinc ore of a milling grade. Plans are being made to sink a 500-ft. shaft to develop the orebodies at depth. A. I. Johnson, of Keystone, S. D., is consulting engineer and geologist for the company and Carl Johnson is manager.

O. N. Hesler, of Elwood, Ind., owner of the patented group of mining claims, approximately 200 acres and formerly the property of the Hoosier Mining Co., has a small crew developing fluorspar ore found on the property. The mine some years ago was developed as a gold property and then was idle for years until 1944, when work was started to develop the fluorspar ore. Two hundred feet of drift has been run and quite a tonnage of ore blocked out and some ore mined, there being about 200 tons of acid fluorspar of commercial grade piled on the dump. The ore also carries good values in lead and silver and some gold. Plans are being made to build a small mill at the property to treat the ore. George H. Wolfe, of Deadwood, is in charge of the work. So far as known this is the only fluorspar deposit found in the Black Hills, although the Bureau of Mines is doing some work at the Frank Peterson fluorspar mine across the line in Wyoming.

Paul Pesonen, engineer from the Bureau of Mines station at Rapid City, has a crew mapping and sampling the mines of the Carbonate Mining Co., at Carbonate, 10 miles northwest of Deadwood. Gold, silver, and lead were discovered in the Carbonate district in the early eighties, and by 1886 Carbonate had become a flourishing town. Production of lead and silver reached its peak from 1885 to 1891. Gold continued to be produced sporadically until about 1911. The Iron Hill mine from 1885 to 1891 produced lead and silver valued at $667,218. The Peabury-Calkins mine was another large producer of lead and silver ore. A smelter was located at Carbonate to treat the lead and silver ores. The gold ores were treated at a smelter in Dead-

Record Output from Adirondacks Mines Aided by *"The Toughest Steel Known"*

Additional millions of tons of iron ore are being poured into the war machine from the redeveloped, historical Adirondacks area where output has reached an all-time high.

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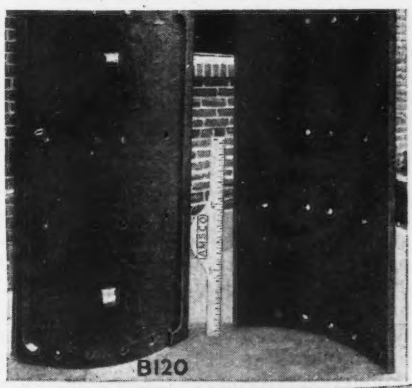
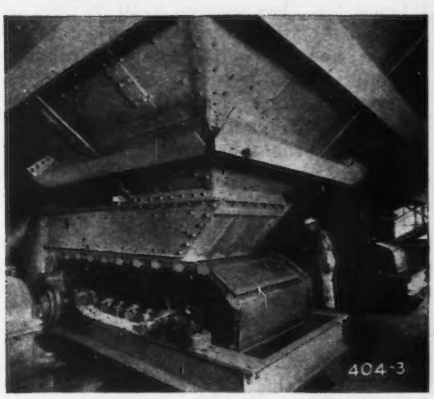
Accordingly, such units as slusher hoes, apron feeders, gyratory, jaw and roll crushers, ball and rod mills, hoppers and chutes, and surface-operated power shovels are fitted with "the toughest steel known" wherever it will do the most good. Some of these applications are pictured.





B-120. Back castings for slushers or scrapers, such as those shown in picture 66289, used in underground mines for scraping ore from stopes to cars. The customer stated, "Manganese steel is specified because it is the best metal for resisting the stresses and abrasion in this work."

404-3. Two Stephens-Adamson Amsco apron feeders (Brayton patent) feeding ore to screens from storage bins. Maximum capacity 700 t.p.h. each.

400-95. This Allis-Chalmers 9' x 16' peripheral discharge rod mill, now dry grinding in an Adirondacks mine, is equipped with Amsco manganese steel liners.

Amsco "Conservation Welding Rods" described in Bulletin 941-W.

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South Dakota (*continued*)

wood. All of the principal mines at Carbonate are now owned by the Carbonate Mining Co. and development work has opened up a large body of medium grade manganese, besides gold, lead, and silver ores. Harold Hedman is manager of the company.

★The Bureau of Mines some time ago finished sampling the Mateen spodumene mine, near Hill City, and is now core drilling the pegmatite dike, which in some places has been found to be 100-ft. wide. Fremont Clark, chief engineer of the Bureau of Mines station at Custer, is in charge of the work.

★Custer Mining Account Co., Harold Hedman, manager, which operates the Victory mica mine, a large producer of condenser mica, has taken a lease and option of the Gap mica mine, 5 miles east of Custer near Syvan Lake. The mine shows a large tonnage of electrical mica. It was formerly worked for feldspar. Equipment has been installed and development is being carried on. The company now employs about 250 persons in its four rifting shops, located at Custer, Hill City, Lead, and Deadwood, and is now rifting only punch mica, so as to get out all the production possible, as the present price on punch mica expires Jan. 1, 1945.

IDAHO

Rich ore found in Interstate Callahan mine—Lucky Friday maintains good production

★The most important major discovery of ore in the Coeur d'Alene mining district since the discovery of the Chester vein at the Sunshine mine has been made at the old Interstate-Callahan property, at the head of Nine Mile Canyon north of Wallace, where Harry P. Pearson, manager of the Daylight Lease Co., has opened a 10-ft. vein of zinc-lead ore. The company took a lease on the old Interstate-Callahan property about two years ago for a period of ten years on a 15 percent royalty basis and cleaned up all the ore left in the old stopes and also milled a large tonnage from the old "gobs" in the mine and from surface dumps. Whatever profit the leasers made they reinvested in a new crosscut, which they drove 2,000 ft. in the hope of opening pay ore in the Nipsic vein, a property the Interstate-Callahan had purchased but had not developed. The old Nipsic Mining Co. had opened a small vein near the surface, but when the Daylight crosscut reached a point where the downward extension of this vein was supposed to be, it wasn't there. The Daylight company then prospected around for it, but could find nothing but scattered bunches of ore. Pearson then decided to drive a raise through to the old Nipsic workings to find out what had happened. He drove this raise 435 ft. through barren ground and during this time purchased the interests of several disgusted Daylight Lease partners. At the 435-ft. mark the raise encountered a small streak of ore, and Pearson started drifting east on it. In a few rounds the vein widened to 10 ft. of solid ore, about 4½ ft. of it clean high-grade galena and the rest high grade zinc-lead mill feed. He drifted on this width of ore for 65 ft. before reporting the discovery, for fear that it might be just another stray bunch of ore. Average muck pile assays of the material broken over a width of 10 ft. show values of 4 percent lead and 8 percent zinc. Pearson hopes to be able to pick up the downward extension of this ore on the tunnel level, but at present is confining all operations to determine the extent of the orebody in length and upward to the level of the old Nipsic workings which are 800 ft. easterly from the present strike. The old Interstate-Callahan company operated extensively during the first World War and declared dividends totaling $7,721,689. In recent years the company has been reorganized and is now known as Callahan Zinc-Lead Mining Co., operating the Livengood placer property, near Fairbanks, Alaska; the Deadwood group, a lead-silver property in southern Idaho and other mines in Nevada and Arizona. The company's only holdings in the Coeur d'Alene district are the Old Interstate-Callahan and Galena properties, the latter of which is in the silver belt west of Wallace.

★Lucky Friday Silver-Lead Mining Co., operating at Mullan, Idaho, under the management of John Sekulich recently made its largest and richest shipment of lead-silver-zinc ore to date when it shipped 1,700 tons of mine-run ore to the Golconda custom mill, for which the company received net smelter returns of $30,937.92. This brings the company's ore production from 800 ft. of shaft development to 15,749 tons which has brought net smelter returns of $161,359.89. Out of this sum the company has paid the purchase price of the property, $15,000, in addition to the equipment and development expense, and has now purchased a new 200-hp. electric hoist in preparation for another 200 ft. of shaft development. None of the mine levels have been exhausted of ore, only enough being produced to continue deeper development and no assessments have been levied against the stockholders, consisting of about 200 local people.

★R. D. Leisk, manager of the Sunshine Mining Co., has issued a preliminary report covering Sunshine mining operations for the third quarter of 1944, stating that production and development work during this time has been confined to the newly discovered Chester vein system, but that tonnage production of the mine has been less during the third quarter than for any other like period because of the manpower shortage, although the company maintains employment offices in Wallace, Kellogg, and Spokane.

★The old King & Queen mine, at Ke

stone, Mont., in what is known as the East Coeur d'Alene district, is reported to have opened a shoot of lead-silver ore of milling grade and said to be 18 ft. wide. The property is under lease to E. G. Smith, of Wallace, who is lessee of the Silver Crescent custom mill on Moon Creek between Wallace and Kellogg. Several truckloads of the King & Queen ore were recently treated at the Moon Creek mill and are said to have shown such satisfactory results as to encourage Smith to purchase a second-hand milling plant, which he is now installing at the King & Queen property. Ross Roundy, formerly superintendent of the Sunset Lease in this district, is mine manager of the Montana property.

★King Mining Co., a Day controlled organization which is purchasing all of the idle mining property between Burke and the Snowstorm mine, at Mullan, has purchased the East Hecla property, east of the Hecla mine, at Burke, which has been added to the King company group. The purchase was made through an order of the district court dissolving the East Hecla company. Officers of the East Hecla company at the time of the sale were W. H. North, E. G. Gnaedinger, C. F. O. Merriam, all mining engineers, and A. H. Featherstone and Margaret Featherstone.

★Little Pittsburgh Mining Co., at Keystone, Mont., has repaired the Nancy Lee tunnel for a distance of 2,300 ft. and is driving a crosscut from this point to reach the Little Pittsburgh oreshoot. The Nancy Lee company cut this oreshoot at a point 800 ft. further in the mountain, but was unable to hold the tunnel open because of moving ground and turned the Little Pittsburgh property back to its original owners, who have again undertaken its development. The crosscut now being run by the company will cut the vein at an estimated distance of 100 ft. A number of carloads of high-grade silver ore have been shipped from the upper workings of the Little Pittsburgh.

★Coeur d'Alene Mines Corp. reports diamond-drill discovery of its faulted orebody on the 2,200 level of the mine, where drilling operations have picked up a vein 8 ft. wide containing silver and copper. Two drill holes have located the vein at a considerable distance apart on an east-west course. Heretofore mining has stopped at a fault which apparently terminated the orebody in an easterly direction. Drifting failed to find the ore east of the fault, but diamond drilling finally located the vein further to the south. Couer d'Alene Mines ore differs from that of other mines in the silver belt in that it is a tennantite instead of a tetrahedrite, carrying more copper than silver. The company is now driving a drift east of the fault to connect with the new orebody.

★The Ima tungsten mine, at Patterson, Idaho, in Lemhi County, is making preparations to double its 100-ton capacity milling plant and its production of tungsten concentrates. Lead and

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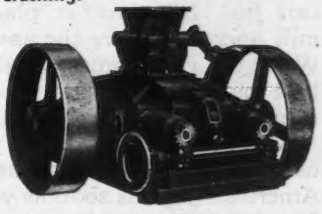

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Idaho *(continued)*

copper are produced as byproducts in the production of tungsten.

★The Orofino mining property, in the Murray section of the Coeur d'Alene district, is being developed under lease by Dan Murphy, former county commissioner, who is driving a crosscut to gain several hundred feet depth on the possible downward extension of an oreshoot which has produced a considerable tonnage of high-grade lead ore.

★Since resuming mining operations in 1942, up to Nov. 1 of the current year the Sidney mine, on Pine Creek, southwest of Kellogg, has shipped 17,854 tons of ore, which has paid the Sidney Mining Co. gross smelter returns of $291,847. The mine was originally operated by Sidney Leasing Co. from 1926 to Dec. 1937, with two suspensions of operations on account of low metal prices. The leasers followed an oreshoot to a depth of about 1,200 ft., but in drifting east on the vein the mineral values became lean and the work was abandoned for several years until the present war improved lead and zinc prices. During the productive period the leasers produced 250,000 tons of ore.

★The New York office of Howe Sound Co. informs us that a statement in the Idaho news on p. 105 of the November issue with respect to the Uncle Sam mine was in error. It was reported that this mine was the only operator in the Blackbird district and was running steadily with about 20 men. The Howe Sound Co. tells us that it has the Uncle Sam mine and a large block of adjoining claims under lease and option, and that no work is being done at present, owing to the manpower shortage.

NEW MEXICO

Grattan mill changes hands—Old Apache mica mine to reopen—New mill near Duncan

★The Grattan mill, at Deming, is being operated by Edgar J. Marston, of Colorado Springs, who also controls a group of fluorspar mines in the Duncan area and the Sadler mine, near Deming. Mr. Marston's headquarters are in Colorado Springs, Colo., P. O. Box 1063. Paul Reinhard, of Duncan, Ariz., is mine superintendent for the organization, and I. S. James, of Deming, mill superintendent. The new operators of the Grattan have changed the name to the Deming mill, and are treating about 60 tons daily of fluorspar from the several Marston properties. Acid-grade concentrate is produced.

★Among the wartime industrial plants recently declared by the RFC to be subject to sale after they have been declared surplus were two New Mexico milling plants. These were International Minerals & Chemical Corp., Carlsbad, including 11 buildings and equipment; and Zuni Milling Co., Los Lunas, an acid-grade fluorspar plant with five buildings and equipment. These are both DPC projects and are now engaged in war work, but the RFC stated that it would enter negotiations at once for sale of these plants subject to the continuance of their present operations as long as needed for the war program.

★Zuni Milling Co., near Grants, now employs about 135 men and is mining fluorspar ore through four shafts. Ore is treated in the mill, near Los Lunas, which was referred to in the preceding paragraph. The company is a subsidiary of Shattuck Denn Mining Corp. J. A. Wilcox, Bisbee, Ariz., is general superintendent, and George A. Warner, Albuquerque, mine superintendent.

★Elmer Burch, and associates, of Taos, are reported to be planning to reopen the old Apache mica mine, in Rio Arriba County.

★Exploration Syndicate, Inc., has been mining copper, lead, and zinc ore from the Carlisle mine, in the Steeple Rock district east of Duncan, and is now treating this ore in its new selective-flotation mill about 6 miles from the mine. J. E. Douglas, of Duncan, Ariz., is general superintendent of the syndicate and Alfred Frank, Salt Lake City, Utah, president.

ARIZONA

Crown King mine to install sink-float plant—Arizona Bureau of Mines resumes ore testing

★Metals Reserve Co. has announced that "unless shipment of manganese ore is materially increased," the Parker, Ariz., chrome-manganese stockpile will be discontinued on Dec. 31. A new program has been inaugurated, lowering the limitations on impurities, which it is hoped will enable many small producers to ship ore which heretofore has not been acceptable. There is no chrome ore in the area served by the agency. The bulk of the manganese ore is received from small mine operators of western Arizona and eastern California.

★Golden Crown Mining Co., operators of the Crown King mine, in Yavapai County, have obtained priorities to install a sink-float unit for the treatment of low-grade ore. The property was originally worked for gold only. However, considerable copper, lead, and zinc ore has also been mined from it. Silas P. Silverman, of New York City, recently purchased controlling interest.

★Resumption of its ore-testing service, inactive since September, 1943, has been announced by the Arizona Bureau of Mines at the University of Arizona at Tucson. Tests are made on ores originating in Arizona, and on samples of less than 100 lb. a minimum charge of $5 will be made. One cent per pound

is added for samples over 100 lb. The fee is made to care for the depreciation of equipment and cost of the analysis, no charge being made for the services of the metallurgist. Dr. T. H. Chapman is director of the Bureau, and George H. Roseveare, metallurgist, will handle the test work.

★Earl Bellman, National Labor Relations Board representative, has been conducting a hearing in the Senate chambers of the Arizona State Capitol building at Phoenix, to determine whether a new election for a collective bargaining agent should be held among the employees of Morenci branch, Phelps Dodge Corp.

★Miami Copper Co., at Miami, has filed suit for recovery of taxes against E. S. Bryant, Gila County treasurer, the State of Arizona and the State Tax Commission, for $37,100.49. The plaintiff alleges the tax rate was 16 c. too high per $100 valuation.

Steel headframe of the Mohawk shaft of Mammoth-St. Anthony, Ltd., at Tiger, Ariz., which was rebuilt after a shaft fire on Sept. 4, 1944. Story of rapid retimbering of shaft appears on page 92 of this issue.

★California Steel Products Co. has installed a new mill at the Silver Bell-Martinez mine, 25 miles from Superior. Prior to the installation of the mill, lead and silver ore had been shipped to an El Paso, Texas, smelter. George F. Bont, Richmond, Calif., is president, and T. S. O'Brien, of Superior, Arizona, is general manager.

★Phelps Dodge Corp., Copper Queen branch, Bisbee, the 79 Lead Copper Co., Hayden, the State of Texas mine, Bisbee, and the Denn mine, at Bisbee, are making regular lead-zinc ore shipments to the Shattuck Denn custom mill at Lowell, Ariz.

★Jeff Martin, Bumblebee, has made a shipment of chalcopyrite copper ore, to the Iron King custom mill at Hum-

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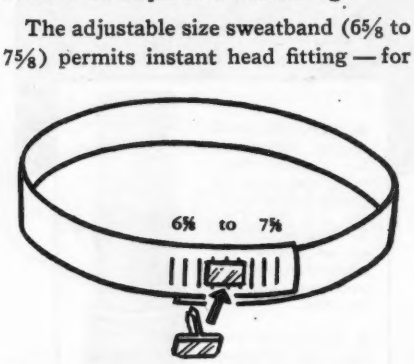

either large or small men. It is not necessary to remove the band; simply release the clip, take in or let out the band and reclamp. To complete the perfect fitting, adjust the hammock height by the adjustable drawstring.

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Arizona *(continued)*

boldt. Development work has been carried on at the property for several months. The mine is five miles south of the Crown King mine, in Yavapai County.

★Roma Tomlinson, Prescott, Arizona, owner of three groups of claims in Crook Canyon, 16 miles south of Prescott, is shipping high grade galena from her Starlight group. Most of the ore carries good gold values. The Westerner group, on which an RFC loan of $8,000 was recently secured, is being retimbered and development work is being done. This was one of the early day gold producers of Yavapai County. Much of the ore mined years ago was amalgamated in their 20 ton stamp mill. Plans are being made to install a modern selective flotation plant on the property.

TEXAS

El Paso mining event well attended—General Somervell lauds "hard-rock" miner

★Approximately 450 members of the mining fraternity attended International Mining Day in El Paso on Nov. 10 and 11, which was sponsored by the Mining Committee of the Chamber of Commerce in an effort to develop El Paso as the mining capital of the International Southwest. Addresses of welcome were delivered by Mayor J. E. Anderson of El Paso, and George G. Matkin, president of the Chamber. Robert D. Bradford, International Mining Day chairman, opened the meeting, and E. M. Thomas, dean of engineering of the Texas College of Mines, introduced the speakers.

At a business session, Philip D. Wilson, vice chairman for metals and minerals of the War Production Board, stated, "To profit fully by a postwar era of full production and prosperity, it seems inevitable that the country must resort to imports of metals to an extent that has never been necessary before. We are going to finish this war with depleted natural resources. A democracy to survive must provide an insurance policy against the future. It has been suggested that we should exchange with other countries by importing raw materials, and exporting the finished product to some degree. We could conserve on raw materials against future needs."

Oscar H. Johnson, of Denver, representing the president of the American Institute of Mining and Metallurgical Engineers, expressed an optimistic viewpoint for the future of the industry in the reconversion period and stated that there would be "no sharp postwar boom or sudden collapse in the mining industry."

C. H. Dunning, director of the Arizona Department of Mineral Resources, stated "Mineral resources are conserved by production and destroyed by lack of production. Production will be an incentive to improve, develop, and discover. If we keep moving, industry will be in a healthier condition."

In a question-and-answer period that followed the speeches, Robert C. Stryker, W.P.B. Regional Director of Dallas, predicted that the conversion of mining from a war to a peace-time industry would be softened by the reconstruction program. He added that mining, like other industries, could expect a 40 percent cutback when the war ends. The mining fraternity seemed to be unanimous in predicting that the plastics industry would not affect the mining industry.

Lieut. General Brehon B. Somervell paid tribute to the "hard-rock" miner for his role in the war, and supplied figures on mineral production from the International Southwest, which showed that the bulk of copper, zinc, and lead came from that area.

Other officials who participated in the event were Maj. Gen. Richard Donovan; Congressman R. E. Thomason; John M. Kelly, director of New Mexico Bureau of Mines; Robert S. Palmer, Colorado Mining Association; and Walterio Sein, representing the Hon. Fernando Foglio Miramontes, Governor of Chihuahua.

TRI-STATE

Eagle-Picher reopens shaft on Needmore tract—M & W Co. reopens old No. 9 shaft

★Production in the Tri-State district dips further as the supply of mine workmen decreases steadily. Weekly output already has dropped slightly below 6,000 tons under ideal weather conditions, and probably will decline further as the winter season sets in. With the labor situation and the general outlook as they are, new mining activities are practically at a standstill.

★Eagle-Picher Mining & Smelting Co. is reopening an old mill shaft on the Needmore tract just north of the famous open-pit mine of the Oronogo Mutual Mining Co. at Oronogo. The shaft is being cleaned out and recribbed. Mining will be carried on at the 220-ft. level. The company has completed some drilling recently on the tract, which has shown good results. S. S. Clarke, general mine superintendent of the company, reported that the drilling is being continued near the shaft development, although a favorable orebody already has been blocked out. Railroad track will be extended to the shaft site from a nearby Frisco spur, a large derrick and hopper will be erected, and ore will be shipped to the company's Central mill south of Cardin in Oklahoma.

★The M. & W. Mining Co. is reopening the old No. 9 shaft on the Huttig lease, two miles northeast of Picher, according to Ralph W. Welty, one of the partners in the company. The shaft has been recribbed to a depth of 53 ft., and will be reopened about the 160-ft. level, where an upper level of ore will be

prospected in that area, Welty said. A hoisting derrick is being built over the shaft. Ore probably will be dumped on the surface, loaded by power shovel in trucks, and hauled to the No. 3 mill of the Beck Mining Co., a half-mile to the southwest.

★The W., M. & W. Mining Co. has moved a large derrick and 400-ton hopper from the B. & R. lease, three-quarters of a mile southwest of Cardin, a half-mile to the northeast to the old Velie Lion mill shaft. The company plans to carry on mine operations on the upper levels of the old mine above the 250-ft. level. An extension, or spur line, will be laid from the NEO railroad near by, and ore will be shipped to the Eagle-Picher Central mill for treatment.

★J. V. Reynolds, of St. Louis, has purchased the Navy Bean mill of the Eagle-Picher Mining & Smelting Co., three miles west of Wentworth, according to P. E. Tabor, of Joplin, who made the successful bid on the property. Reynolds and those interested in the acquisition have taken a lease on 800 acres of mining tracts designated as the Owen land in the Wentworth area, Tabor said. The group plans to sink several shafts on shallow zinc deposits drilled out in the area, and to operate the 40-ton-an-hour concentration plant, which was built by Eagle-Picher about four years ago, as a custom mill. Tabor also reported that Ed Lawrence, of Fort Worth, Tex., is among those who plan to sink a new shaft in the Wentworth area.

★St. Louis Smelting & Refining Co. is reopening the old north field shaft on the Hartley lease, north of the Ballard, or No. 8, mill to improve underground ventilation in that area, according to Howard H. Utley, of Baxter Springs, district manager of the company. The company has been trucking ore from another field shaft on the Hartley to the Ballard mill for some time. A steel derrick and 500-ton hopper were moved from the Robob lease, west of the Ballard, to the reopened Hartley mine a few months ago.

ARKANSAS

New MRC manganese requirements will injure Batesville district's production

★Scarcity of labor is still the greatest obstacle holding back ore production in the Batesville-Cushman field. Miners, who, with their families, left for the lowlands late in August and early in September to pick cotton, are expected back in December.

★Metals Reserve still holds to its plan to change the specifications on manganese ore Jan. 1. This change will be a serious blow to local operators. The Metals Reserve buying depot at Batesville has been buying ore produced in the field for many months. Present specifications are: ore that runs from 35 per cent up, carrying no more than 1 percent phosphorus. The new speci-

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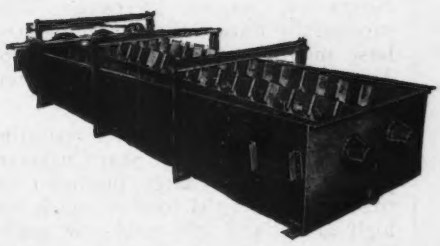

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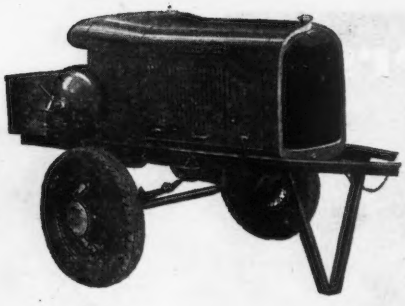

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Arkansas (*continued*)

fications, which will go into effect Jan. 1, are: Ore from 42 percent up, that carries no more than 0.3 percent phosphorus content. If these new specifications are put into effect, Metals Reserve will probably have to close its buying depot at Batesville, for only a small percent of the ore produced in the field will come within these limits. Metal Reserve will also reduce the price of ore approximately 15 percent, and producers will, in addition, have to pay freight on ore shipped to the furnaces. Efforts will be made by local operators to have these new specifications annulled.

★Production in the Batesville-Cushman field ran to a total of 1,295 tons in October, against 1,298 tons in September. Of the 1,295 tons produced in October, 329 tons were high grade, 300 tons medium grade, and 666 tons low grade. Metals Reserve purchased practically all of the ore that ran from 35 percent up.

★The Metal Reserve stockpile of low-grade wad ore at Cushman is gradually being reduced in size. During the last 30 days, 2,000 tons from this stockpile have been shipped to the Woodward Iron Co., of Woodward, Ala. Loading of trucks was done with a power shovel.

★Marshall McGee and Preston Grace, of Batesville, operating the Chin properties in the Cave Creek district, and the Walter H. Denison Manganese Co., also now at Batesville, tied in top production in the field in October. McGee and Grace produced 450 tons, 300 tons of which were medium grade and 150 tons low grade. They have two new shafts in production and are also mining a big tonnage from their main tunnel, which was flooded for nearly a year.

★Walter H. Denison Manganese Co., formerly of Cushman, now of Batesville, produced 450 tons in October, 300 tons of which was low grade and 150 tons high grade. Most of their production came from their properties in the Pfeiffer district. Reed Denison, in charge of operations, has also been mining manganese near Winslow, Ariz. He closed down operations out there in November, because he cannot mine successfully during the winter months. Last month the Walter H. Denison Manganese Co. moved its headquarters from Cushman to Batesville.

★Arkansas Manganese Co., operating the Aydelotte property, near Cushman, Jack Gibbons in charge, produced 290 tons in October, 94 tons of which was high grade and 196 tons low grade. The company expected to have a two-drum dragline in operation in October, but failed to get it started. It should be in operation in November, and will help a lot to increase production.

★M. N. Glumicich, of Batesville, in charge of the Blake property, near Cushman, produced approximately 30 tons of high grade in October. He is operating two small washing plants. The property was recently purchased by John Marsich, of New York City.

★Hendricks Mining & Milling Co., in charge of Alvin Hendricks, of Batesville, operating on the Polk Southard and other properties near Cushman, will start its washing and concentrating plant in November. The company has been shut down for the last two months. The Arkansas Power & Light Co. has recently completed a line to the plant.

★S. & G., Inc., operating the Hurricane mine, in Searcy County, near Pindall, has its plant in operation. Production to date runs between two and three cars of high-grade zinc carbonate concentrate. J. Tom Grimmett and J. C. Shepherd, of Harrison, are in charge. Recent rains and a new well have increased water capacity enough to permit one shift a day. The clay orebody being worked carries approximately 10 percent zinc. The new plant will handle about 30 tons an hour.

★Moark Mining Co., operating the Almy, Red Mill, Jack Pot, and other properties at Zinc, in Boone County, put its plant in operation early in November, handling about 5 tons of crude an hour. The ore being milled is mined by James Rogers on the Coon Hollow property. Cleve Byrd is in charge at the plant.

★Mining has begun on Section 16 in Marion County, Ark., by Louis Frader and associates of Eureka Springs, Ark. They are driving a tunnel into a good face of high-grade zinc carbonate ore, and part of their mill equipment has been moved in.

MICHIGAN

One-day walkout interrupts Copper Range Co. output—C&H to drill Estivant property

★The board of directors of Calumet & Hecla Consolidated Copper Co. has appointed E. R. Lovell president, and A. H. Wohlrab general manager, of the northern Michigan operations. Mr. Lovell, who has been general manager since 1941 and vice president since 1942, succeeds the late A. E. Petermann, who died on Oct. 15. Mr. Lovell is a graduate of the Michigan College of Mining and Technology at Houghton. Mr. Wohlrab comes to Calumet & Hecla from Timmins, Ont., where he has been assistant to the manager of the Hollinger Gold Mining Co. since 1934. He will assume his new duties Jan. 1, 1945. He is a graduate of the Michigan College of Mining and Technology. After his graduation, he worked for a time in the efficiency department of Calumet & Hecla and then became assistant superintendent of the Isle Royale Copper Co. He eventually was appointed superintendent. Upon the closing of Isle Royale in 1932, he went to the Calumet conglomerate operations, where he remained until 1934.

★Production at the mines of the Copper

Range company was interrupted for a day recently when a small number of surfacemen staged an unauthorized walkout. They protested a company order reducing their work-week from 48 to 40 hours. The shorter week did not apply to underground workers, but the mines could not operate as long as the surfacemen remained out. The latter agreed to return, pending negotiations. Due to a shortage of underground men, the company contends that the number of men on surface is out of proportion. Rather than lay off any of the surface workers, the company obtained permission from the War Manpower Commission to go on a five-day 40-hour week.

★Salaried employees of Calumet & Hecla will be able to participate in a Retirement Income Plan recently established by the company and approved by the U. S. Treasury Department. The plan supplements the Federal Social Security program, and its benefits are based on earnings which are not covered by the Federal Security Act. It provides that the normal retirement age is 65, and that after an employee who is covered by the plan retires he will receive a monthly annuity as long as he lives. All salaried employees who have been with the company for three years may participate in the plan if they are earning more than the maximum amount covered by Social Security.

★An extensive diamond drill program has been started by Calumet & Hecla on its newly acquired Estivant property in the vicinity of Copper Harbor. The E. J. Longyear Co. has the contract to do the drilling. It has set up a camp to house the drill crew and equipment. The camp buildings were pre-fabricated by the Calumet & Hecla construction crew in the company's carpenter shops.

★A crew is engaged in sinking operations in Calumet & Hecla's new Iroquois shaft, which is now well below the 2,000-ft. mark. The drift on the north side of the 18th level is being extended at the rate of 12 to 13 ft. per day by a four-man crew to a shift. The men are operating at a point about 1,600 ft. from the shaft. On the sixth level, work is being done in preparation for resumption of stoping.

IRON COUNTRY

Meetings begun in Michigan for studying valuation methods —Plymouth stripping started

★At Plymouth mine, operated by Pickands, Mather & Co., near Wakefield, Mich., stripping has been started with shovel and trucks by Peter Kiewit & Co., contractors, who will remove approximately 1,200,000 cu. yd. Most of this material will come from the north side of the pit. Everett Osborn is superintendent.

★The first of a series of meetings to

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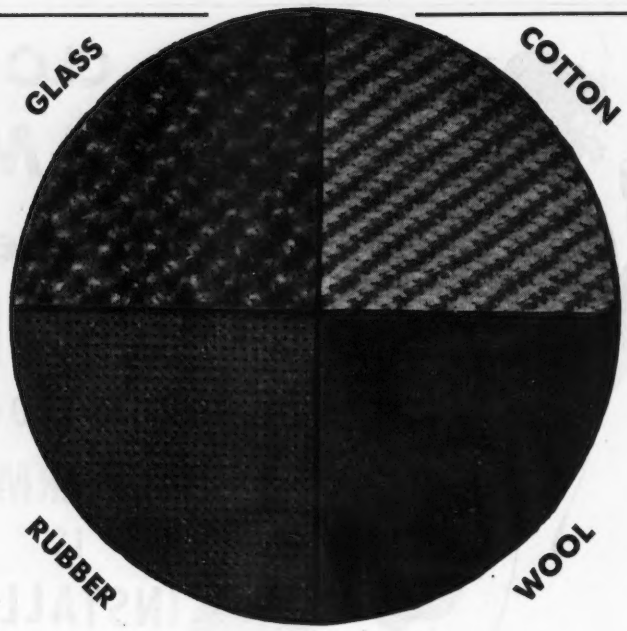

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Iron Country *(continued)*

be held by a State subcommittee at Ishpeming, Houghton, Bessemer, and Crystal Falls for studying methods of valuation of mining property for tax purposes was held Nov. 13. The committee will report to the advisory tax study committee appointed by Governor Kelly. At the head of this committee is Prof. E. Blythe Stason, of the University of Michigan. The other two members are George P. McCallum of Lansing, and George E. Bean, of Escanaba, Mich. It is hoped that the officials of the municipalities and the mining companies can reach a common understanding through discussions of problems affecting the industry.

★Guy B. Hunner, at one time superintendent of the Zimmerman mine, on the Menominee Range, has been assigned to supervise the Portsmouth and Wearne open-pit mines on the Cuyuna Range in Minnesota for the M. A. Hanna Co. These mines have previously been operated by Evergreen Mines Co., Perry Harrison manager.

★Miners are becoming more scarce on the Marquette Range. Many have signed contracts to work in the shipyards at Bremerton, Wash. The pay schedule ranges from 89c. to $1.05 per hour, which is only a little higher than the mine scale. This exodus is slowing down ore production.

★At Escanaba, Mich., the No. 3 iron-ore loading dock, built by the federal government in 1942, is to be dismantled by C. G. Bridges, a local contractor. This was erected under contract by Merritt Chapman Scott Corp. as a war emergency project to speed the shipment of iron ore if the Sault St. Marie docks were bombed. The No. 1 dock was almost completed and still stands but has not been needed. During the shipping season two other docks have been in regular operation.

★At the Lloyd mine of Cleveland-Cliffs Iron Co. near Ishpeming, Mich., a new procedure has been developed to loosen up the material in frozen ore stockpiles which are about 40 ft. high, so as to eliminate the dangerous overhang due to layers of frozen ore. In the spring before loading starts, a series of 2-in. diameter holes, 10 ft. deep and 16 ft. apart, is drilled through the center of the pile with a type CC-60 pavement-breaker air drill driving a pointed pipe through a special chuck attachment. Into these holes is poured half a bag of Hercules No. 4 powder, with a blasting cap primer placed on the bottom, and the rest of the hole filled with fine dry ore. The caps are connected in series and set off with a blasting machine placed at a safe distance. This early blasting gives the spring rains a chance to percolate through the vertical cracks and thaw out the frozen layers before they are loaded. If the pile is badly frozen the hole spacing is reduced to 8 ft. No trouble from overhang has developed since this system was adopted.

★Shipments from the Lake Superior district for October totaled 10,594,988 tons, a decrease from a year ago of 1,017,554 tons. Shipments for the 1944 season to Nov. 1 totaled 76,498,172 tons, a decrease of 216,665 tons, compared with the previous season.

★Important changes are to be made this winter by Oliver Iron Mining Co. at its Spruce iron mine, at Eveleth, Minn., on the eastern Mesabi. The Spruce at present is both underground and open pit. Part of the area of the underground mine will be stripped, necessitating changes on the surface. Some of the buildings are being dismantled and will be replaced by others on a new permanent site. Inasmuch as the stripping will establish a new surface 70 ft. below the present collar, the headframe will be re-erected next spring on a new collar of the same shaft 70 ft. below.

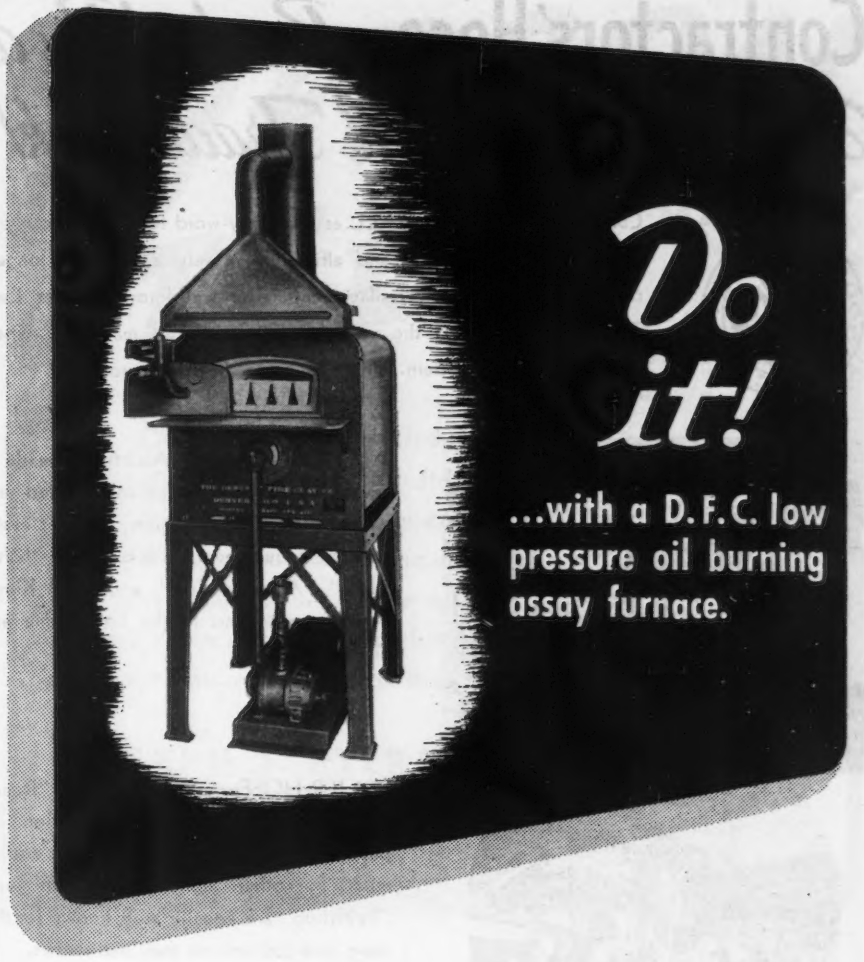
★Interstate Iron Co., Virginia, Minn., will install a belt conveyor system at the Hill-Annex open-pit iron mine at Calumet, Minn., this winter. Most of the remaining ore is now tied up in track benches and with the new conveyor running from the pit bottom up to the natural ground level, the track benches will be abandoned and the ore tied up will be available for extraction. The total length of the conveyor will be 1,300 ft., of which 175 ft. will pass through an incline tunnel in the pit bank.

WASHINGTON

ALCOA executive sees good future for Northwest—New magnesite sources developed

★Arthur P. Hall, of the Aluminum Company of America, said in Portland in November that his company plans great expansion and that this should begin in the vast region west of the Rocky Mountains, which he described as America's greatest industrial frontier. He is chairman of the company's committee on postwar facilities and development. "Our company's laboratories for years have been experimenting with the extraction of alumina from a number of Western ores, and we would welcome a practical and competitive economical method of getting alumina from ores other than bauxite, particularly from ores in the West," he said. Word has reached the West that both Alcoa and Reynolds Metal Co. have shown an interest in acquiring the government's aluminum plants near Spokane, and Electro-Metallurgical Co. has indicated a willingness to purchase and operate the magnesium plant at that place.

★Northwest Magnesite Co. is letting contracts to develop additional sources of magnesite at Chewelah, according to C. A. Sargent, manager. The company has let a contract to Colonial Construction Co., of Spokane, to remove the waste overburden on the magnesite



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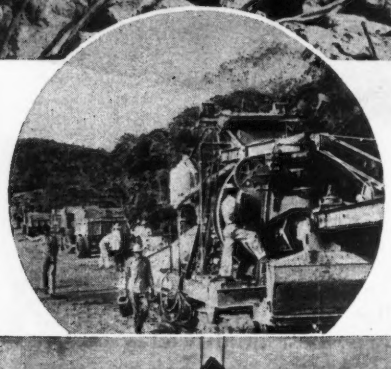

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Washington (*continued*)

company's Keystone property, five miles beyond the quarries at Browne's Lake from which it is now taking material. The Riblet Tramway Co. of Spokane, also has been given a contract to build a five-mile wire tram from the Keystone quarries to Browne's Lake. This contract includes the construction of a wire terminal at the Keystone. Magnesite will be moved from the Keystone over the new tram and then over the present tram to the company's reduction works at Chewelah, 12 miles from the Keystone quarries. Northwest Magnesite Co. will thus be in a position to continue supplying, as at present, its plant at Chewelah as the supply at Browne's Lake diminishes. Earl A. Garber, vice president and general manager of Northwest Magnesite Co., is now stationed at Pittsburgh, Pa.

★War workers at the Trentwood rolling mill have signed a pledge to stay on the job until victory is achieved in all the theaters of war. It is a pledge made to all the armed forces, and is inscribed on a scroll which will be sent to General George C. Marshall, Army Chief of Staff, and to Admiral Ernest J. King, Chief of Naval Operations, who will be asked to forward it to Generals Eisenhower and MacArthur, and to Admiral Nimitz. The pledge reads, "I will keep faith to the armed forces of the United States of America, living and dead, and will do my best in producing aluminum aircraft sheet until victory is won."

★Pilot plant testing of the carbothermic method of producing magnesium will be continued at the Washington State College, at Pullman, when the plant now being built is completed. Research has been under way since 1936 on the production of magnesium from magnesite. H. A. Doerner, of the United States Bureau of Mines, is engineer in charge.

★Heirs of William B. Hopkins and S. W. O'Brien have brought suit, at Newport, for the eviction of Pend Oreille Mines & Metals Co. from certain acreage west of Z Canyon, in the Pend Oreille River. The late S. W. O'Brien located placer ground which is said to be in conflict with holdings of the Pend Oreille company.

★A mine-to-market road has been built to the Little Noisy mine, on Sullivan Lake, in Pend Oreille County, and mine development has started.

ALASKA

Army to sell mining equipment at Fairbanks—Protest Ickes' Indian reservation proposal

★The United States Navy, it is understood, plans to start its first oil well in the new district east of Point Barrow in April. Rear Admiral S. A. Trexel, of the Navy's civil engineering corps,

says a survey is being made for a possible 500-mile pipe line from the oil field to Fairbanks. The expedition, consisting of a Liberty ship and a navy auxiliary, with equipment, arrived at Point Barrow in August. Equipment includes a core-drilling rig and a standard oil-drilling rig, and is to be sent into the interior in January when lakes and marsh land are frozen so that tractors can pass over them. The drill has a 2,000-ft. capacity.

★"Alaska's industrial and economic future is in grave jeopardy as a result of Secretary Harold L. Ickes proposal to set aside a large area in southeastern Alaska for the exclusive use of a small group of Indians," says a resolution unanimously adopted by the trustees of the Seattle Chamber of Commerce. It was proposed by the Alaska committee under the leadership of E. N. Patty, its chairman. The scheme was denounced as an effort to "give Alaska back to the Indians." The resolution further says "this wholly backward, reactionary, and destructive proposal would have the effect of changing the status of Alaska Indians from that of equal American citizenship to wards of the federal Bureau of Indian Affairs." As the plan is to do this by creating reservations for certain Indians, the Seattle Chamber urges Congress to take back to itself the sole power to create reservations of any kind. This is proposed on the theory that certain Indians have "aboriginal rights" to large areas and extensive fishing waters in the Territory. Cabin No. 1 of the Alaska Yukon Pioneers in Seattle has adopted resolutions opposing the establishment of reservations based on the aboriginal claims of the Alaska Indians. George Folta, special counsel for the Interior Department, addressed a large gathering in Juneau and explained what is meant by "aboriginal rights." His audience was composed chiefly of federal and territorial employees.

★David E. Browne, representing RFC, has established at Fairbanks a depot for the accumulation and disposal of mine equipment furnished by the Alaska Department of the Army. He will sell this to miners or mine corporations at reasonable prices. The supplies include everything from blankets to heavy machinery and mine equipment, as well as buildings and other real estate. He says the government expects to make no profit, and, on the other hand, will make no speculative sales. He explained the plan to the Alaska Miners' Association at Fairbanks, in October. What is not sold will be shipped back to the States if usable, or destroyed if it has no value. Persons desiring any kind of equipment can file their needs with him, and will be notified whenever such equipment comes in. Besides sales directly to miners, parts are offered to regular dealers. He says that to sell parts direct to users would have the effect of putting local dealers out of business, thus injuring instead of aiding the mining industry. Prospective buyers

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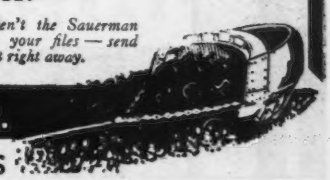

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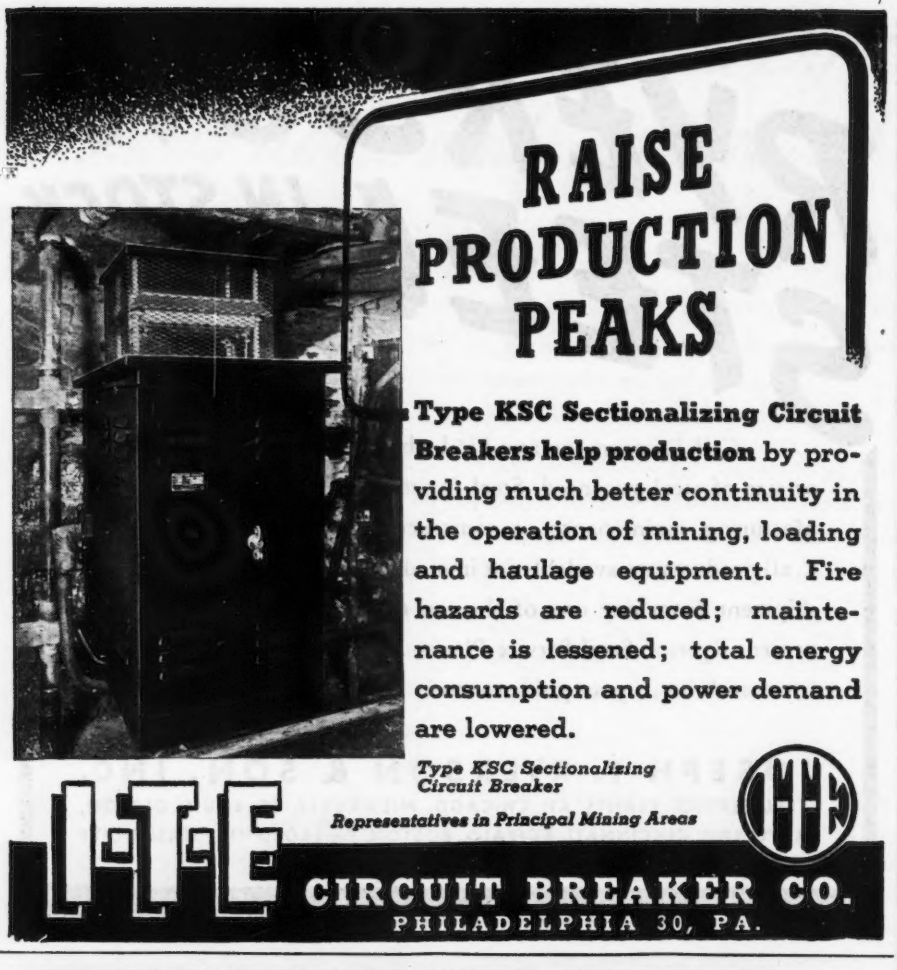
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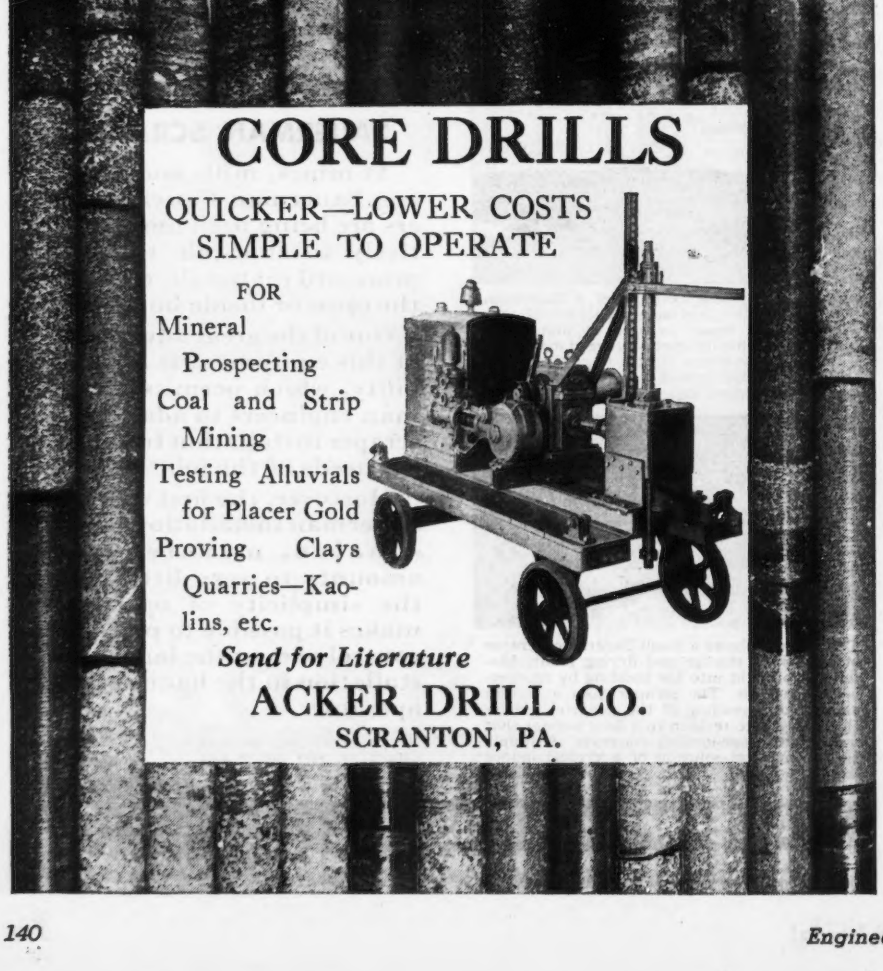

Alaska (*continued*)

are permitted to test the equipment.

★Walter W. Stoll, newly elected president of Buffalo Coal Mining Co., has announced plans for further production at the company's property on Moose Creek, near Palmer. He says the Army has reduced its demands, which has made more fuel available for householders and other local institutions. Changes in the underground system are contemplated, and it is planned to bring production up to 300 tons daily within a year. This will require additional labor. The company also will encourage the development of an electric power plant to serve neighboring coal mines as well as gold mines in the nearby Willow Creek district.

CANADA

CIO seeks nickel worker wage increase—Josephine mine to start production in 1945

★Canadian copper producers were notified late in October by the British Ministry of Supply that contracts to supply the United Kingdom would not be renewed when they expire Jan. 31, due to adequate stocks. Before the end of November, marketing problems will be discussed in London by representatives of the following companies: International Nickel, Falconbridge, Hudson Bay, Sherritt Gordon, Noranda, Waite Amulet, and Normetal. The average price set for these mines was increased in 1943 above the basic figure of 10.02c. a pound. due to the labor shortage and other factors contributing to higher costs. Substantial financial sacrifices were made by Dominion copper producers in supplying metal at the low price levels established in London. Recently, British stocks of refined copper were estimated at 300,000 tons, which compares with 1943 shipments from Canada amounting to 289,491 tons.

★Acting on pleas made by Noranda Mines and Quebec Manitou Mines, conciliation boards have been appointed to decide disputes between them and the CIO union. Though agreeing to collective bargaining, Noranda had not accepted demands for the check-off and wage increases. The Quebec Manitou disagreement was also concerned with these terms. A unanimous report has been given by a Board of Conciliation against allowing the check-off for employees of the Lake Shore mine at Kirkland Lake.

★Falconbridge and International Nickel have been notified by the CIO union of Sudbury that application is being made to the National War Labor Board at Ottawa for pay increases amounting to a dollar a day for mine and smelter workers. Formal notice was served following refusal by the companies to grant the pay increases.

ONTARIO

★Production is to be started in 1945 at the Josephine property of Michipicoten Iron Mines. The development has been in progress for the last two years under joint control of Sherritt Gordon and Frobisher Exploration. According to preliminary reports, hematite from the Josephine would be shipped as lump. Reserves were last stated to be 2,666,000 tons averaging 53.94 percent iron and 15.67 percent silica. The orebody has a proved length of 1,500 ft. and an indicated extension of 2,700 ft. The sintering plant of Algoma Ore Properties, at Michipicoten Harbor, would treat the siderite ore from the Ruth mine, located within a mile and a half of the Josephine. Indicated ore reserves at the Ruth exceed 28,000,000 tons averaging better than 31 percent iron, as reported by Eldon E. Brown, general manager of Sherritt Gordon Mines.

★Work was started in October on a new open pit at the Helen mine on the Michipicoten iron range, 12 miles north of Michipicoten Harbor, Lake Superior. Controlled by Algoma Ore Properties, Ltd., subsidiary of Algoma Steel Corp., the development will lead to opening additional reserves. Since 1939, production has come from the main open pit, and it is announced that ore remaining here will be mined by underground methods. The high silica content will be removed in a sink-and-float unit. Shipments in October amounted to 63,776 tons and for the 1944 season to Nov. 1, 416,473 tons.

★The original shipment of 12,300 gross tons of iron ore from the Steep Rock mine left the dock at Superior, Wis., Oct. 15, and it is planned to ship at least one more cargo before the close of the season. Premium Iron Ores, Ltd., a Canadian company formed by the Cyrus Eaton interests as sales agent for Steep Rock output, has undertaken the marketing of 10,000,000 tons in the first ten years of production. Gen. D. M. Hogarth, president of Steep Rock Iron Mines, Ltd., reports ore mined this year to be of a grade higher than indicated by the exploratory drilling, so that the company "is raising substantially the guaranteed grades for 1945." Dried analysis of the first ore delivered, which was lower in quality than the typical material to be mined, was 59.5 percent iron (53.6 percent natural iron), compared with 60.8 percent from the analyses of composite samples secured from churn drilling. Phosphorus in the ore shipped was 0.021 percent, compared with 0.017 percent for the drill samples. Plans have been completed for shipping a 1945 minimum of 1,000,000 tons, which is to be increased in 1946 and 1947. In the open pit on the "B" orebody, stripping has been adopted on a large scale, representing an important change from the original plan of slicing the dirt overburden, year by year, from the ore as mining advances. The change in operating technique is expected to reduce costs of moving overburden through use of hydraulicking

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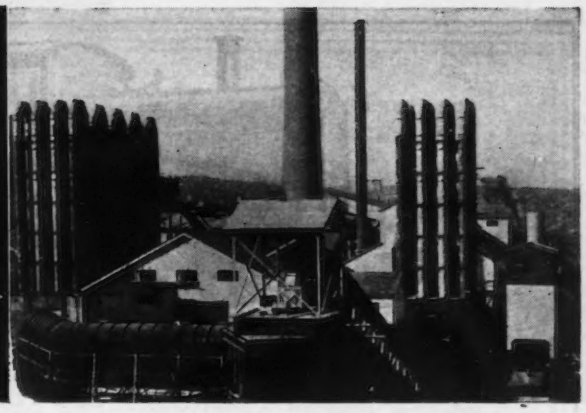

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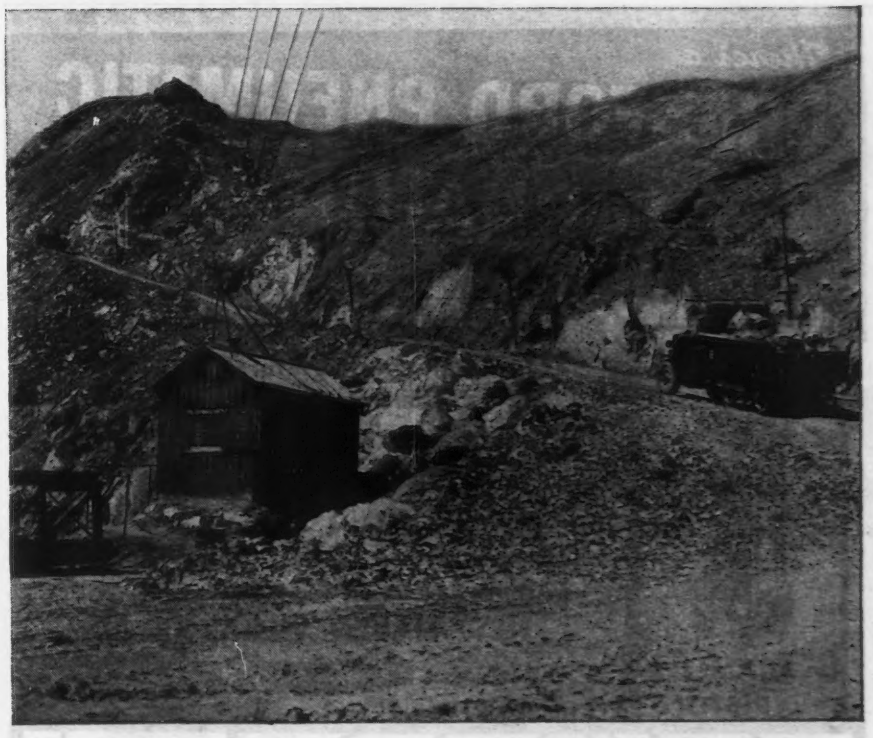

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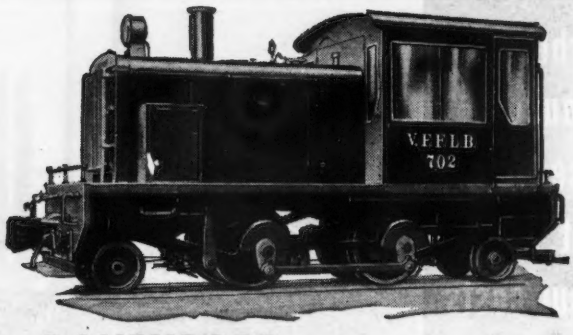

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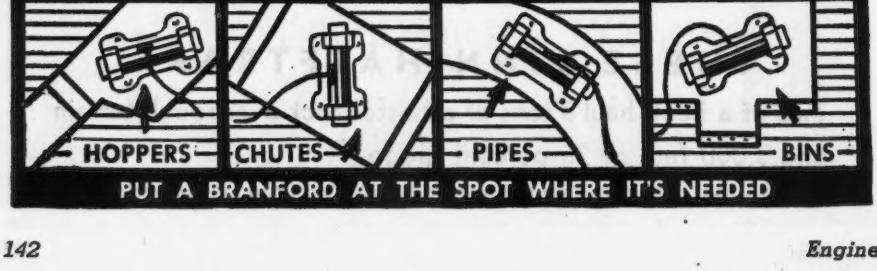

PUT A BRANFORD AT THE SPOT WHERE IT'S NEEDED

Canada (*continued*)

and washing methods. Stripping is to be extended to the whole area surrounding the open pit, resulting in lower costs and increased safety.

To obtain maximum tonnage in 1945 mining and full-scale stripping will proceed during the winter, and considerable ore will be stockpiled for shipment after break-up. This stockpiled ore will supplement that produced during the regular shipping season.

★A camp is being established on the Midlothian property of Novell Porcupine Gold Mines, located near the recently announced discovery of Laroma Midlothian Mines. As part of the extensive activity planned for this new area, Novell reports that exploration is to be done through the winter. M. P. McDonald, consulting engineer, states that trenching has opened a promising shear zone for 900 ft. Preliminary sampling has indicated an average of $16 gold per ton.

NORTHWEST TERRITORIES

★Preparations are being made by the town of Yellowknife for next summer's expanded activity. Important results secured from exploratory work on the Giant Yellowknife property give promise of accelerated output for the district that had produced approximately $15,000,000 to the end of 1943. Plans for extensive work by various companies financed recently in Toronto indicate sustained activity through this winter. The trading post of the Hudson's Bay Co. at Yellowknife has been enlarged and branches have been established there by two more Canadian banks. It is believed that next year's activity will be dependent on drilling results secured this winter. The Yellowknife office of the Canada Department of Mines reports that about 9,000 mining claims have been registered. The local government is under jurisdiction of the Northwest Territories Administrative Council, appointed by the Governor-General in Council at Ottawa.

★Nib Yellowknife Gold Mines has reported favorable results from the first holes, located 100 ft. apart, of a large projected drilling program on the Nib-Samex claim group. Norman Byrne, engineer in charge, states that well-mineralized shearing 6 to 23 ft. in width has been intersected. A larger drill is being secured.

★Fred M. Connell, president of both the Conwest Exploration Co. and the McVittie-Graham Mining Co., reports that 753,130 shares of Conwest stock held by McVittie-Graham are being distributed to stockholders, as authorized at the meeting last August. The distribution is rated by Ottawa authorities as a return of capital and not subject to income tax. Conwest Exploration controls seven properties in the Yellowknife area, British Columbia, and Alaska. C. L. Coleman is consulting engineer.

★Favorable results have been reported from the first three holes of a new diamond drilling program on the Yellowknife property of Conwest Exploration Co., adjoining the Con mine of Consolidated Mining & Smelting Co. Hole No. 15 disclosed 5 ft. of core averaging $9 per ton in gold; No. 16 intersected 10 ft. averaging $6.15 per ton; and No. 17 showed $5.39 across a width of 7 ft. Additional holes are being drilled at 100-ft. intervals. Previous drilling farther north had given little encouragement from a shear zone that was believed to be an extension of the Constructure.

★A magnetometer survey is in progress on the claims held by Nash Yellowknife Gold Mines, located south of Consolidated's Ptarmigan mine of Consolidated Smelters. Arrangements have been made for drilling, to be started when the survey has been completed.

★Recent drilling on the property of Giant Yellowknife Gold Mines, controlled by Frobisher Exploration Co., has resulted in extending the Dadson zone to a length of 1,500 ft. Commercial possibilities have been established by drilling on three other structures, the South zone having an indicated length of 1,400 ft.; the East zone, intersecting the South zone near its north end, is 1,200 ft. long; the West zone, bordering the West Bay fault, is only partly explored. Several years ago, previous owners shipped 74 tons of ore from the 126-ft. shaft to Trail, B.C. This ore averaged 8.7 oz. gold per ton. On Nov. 15 the directors will meet to consider raising approximately $1,500,000 to finance additional drilling and development. G. R. Burge is president.

BRITISH COLUMBIA

★In a statement at Vancouver S. G. Blaylock, chairman of the board and managing director of Consolidated Mining & Smelting Company of Canada, Ltd., said that all former employees now on active service would be reabsorbed in the company's operations. This assurance had been given the men and women before any governmental regulation stipulated such requirement. It is estimated that 2,500 Consolidated employees are now in the armed forces. More than 70 percent of employees on active service replied to a questionnaire mailed by the company, and of these 97 percent signified a desire to return to their former positions.

★The annual Western meeting of the Canadian Institute of Mining and Metallurgy, which opened in Vancouver on Nov. 15, was the largest since the commencement of these annual events. An innovation so far as meetings in British Columbia are concerned was the provision of sectional technical sessions to convene separately but contemporaneously. This means that instead of the five or six technical sessions to which in past years these meetings have been confined, there were not fewer than nine. Six Provincial Ministers of Mines were in at-

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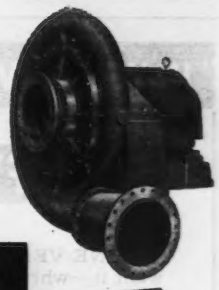

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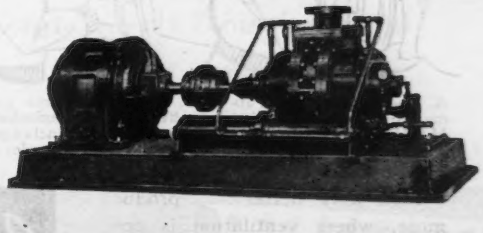

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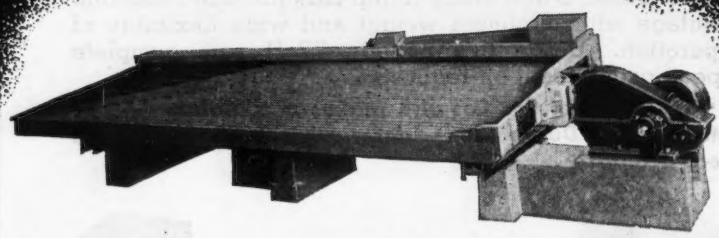

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Canada (*continued*)

tendance, and the meeting was favored with the attendance of prominent educators.

★During the third quarter of 1944, the gross recovery from ore mined on the Northern Light claim of the Premier Border Gold Mining Co., Ltd., was valued at $16,077. After cost of mining of $4,264, and marketing expense and taxes amounting to $6,006, net profit of $5,807 was applied to reduce the balance of advances made by Silbak Premier Mines. Indebtedness has been reduced to $10,616.

★A deal is nearing completion whereby Pioneer Gold Mines of B. C., Ltd., will acquire a one-third interest in the Little Billie and Copper Queen mines, on Texada Island, from Industrial Metals Mining Co., Ltd., for a cash investment of $300,000. Ore reserves exceeding 100,000 tons of better than $12 value per ton, principally in gold, have been developed as a result of recent work. It is proposed to bring the property into production as soon as Federal restrictions are relaxed.

★Two new quartz veins have been found by diamond drilling at the Bridge River property of B. R. X. (1935) Consolidated Mines, Ltd. The No. 3 hole, driven from the main-crosscut tunnel to explore the mineralized area of diorite-serpentine contact on the Berta claims, intersected a 2-ft. vein at 1,034 ft. and a 3-ft. vein at 1,100 ft. Further drilling, from the Hurley River canyon, to explore the same veins at greater depth, is now under consideration.

★An option on the Miracle mine, about nine miles from the city of Nelson, has been acquired by Consolidated Mining & Smelting Co. of Canada, Ltd. A drilling contract has been let to T. Connors company, of Vancouver.

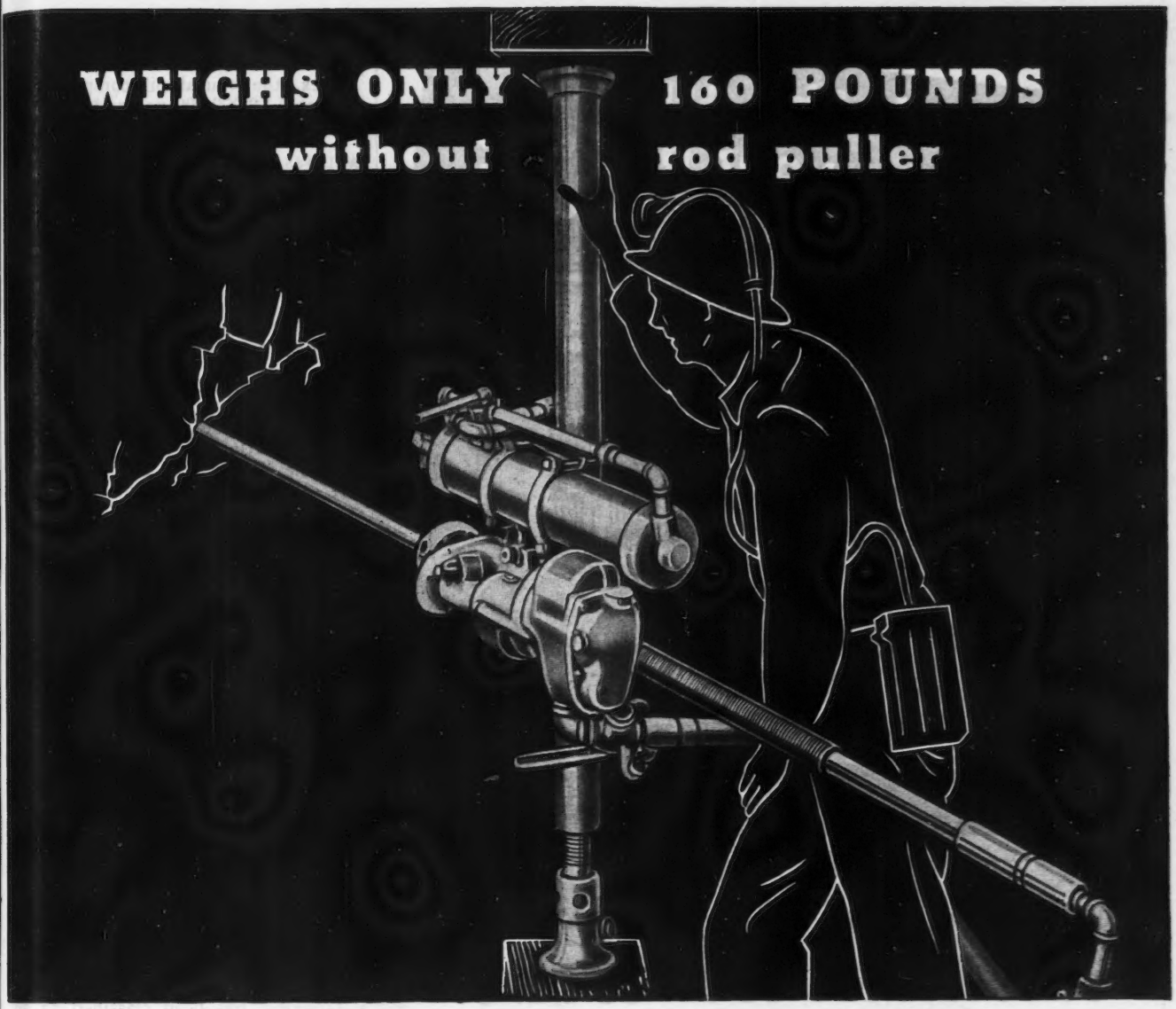
YUKON TERRITORY

★Due to labor shortage, Yukon Consolidated Gold Corp. worked only three of its nine gold dredges during the past season, according to W. H. S. McFarland, general manager. He doubts if more dredges will be worked in 1945, but says they will be if men can be secured. About 20 percent of normal crews worked last season.

MEXICO

Federal agencies stimulating small mine operations—Postwar mining program developing

★Late fall found mining in Mexico doing but fairly well, with a minimum of labor troubles, with production holding up, and exports moving, though still hampered by poor rail transportation. Oil fuel shortage again affects some companies, most important of which are Kildun and Santa Maria de la Paz,



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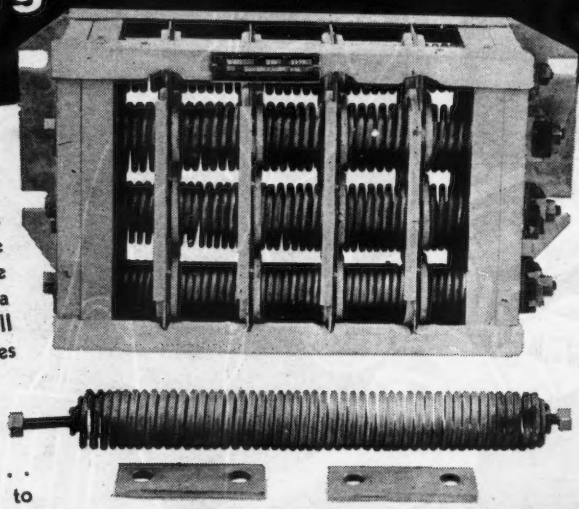

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Mexico (*continued*)

both operating in San Luis Potosi. Pemex, the official oil company, has budgeted 10,000,000 pesos ($2,150,000) for new pipelines in 1945 and 1946.

★It was further reported recently that Kildun Mining Corp., Matehuala, S.L.P., had asked the federal board of conciliation and arbitration for permission to suspend operations entirely because they are no longer profitable. The company has run a 400-ton gold-silver cyanide plant under contract with A.S.&.R., and was at one time employing about 1,000 men.

★Development work continues. Among these activities are the contract made by the National Commission for Stimulating the Mining Industry with the Cia. Minera G. Guadalcazar, S.A., to work gold placers in Guadalcazar municipality, San Luis Potosi; and the purchase from Juan F. Robinson, Tonichi, Sonora, by Clayton R. Jones and John C. Higgins, Portland, Ore., of gold and silver properties near Tonichi, terminal of the Yaqui Valley branch of the Southern Pacific Railway of Mexico. The deal includes the Tescalama group, from which Robinson is said to have shipped 120 carloads of ore, running $35 (U.S.) per ton in gold and silver, from a vein averaging 7 ft. wide, and which is reported to have 10,000 tons of high grade blocked out. Work will be directed by A. E. Johnson, Arizona mining man. Still another project is the installation by R. O. Moore, long an operator in the Mexican northwest, of a 25-ton treatment plant near Quitovac, Altar District, Sonora, a service that is expected to intensify work at several mines in that zone.

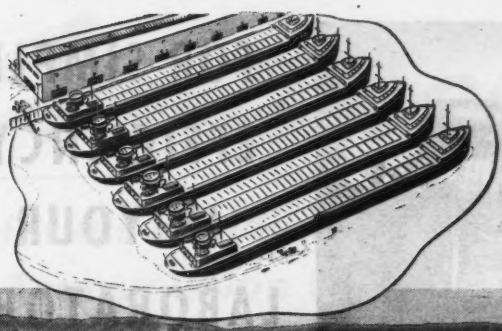
★Because its principal owner, Dr. Karo, a Japanese, has been classified as an enemy alien, La Azul mine, important fluorite property, Taxco, Guerrero, must continue in possession of the Enemy Aliens Properties Vigilance and Administration Board and be worked for national benefit by the National Commission for Stimulation of the Mining Industry, the federal supreme court ruled in refusing part owner, Frederick Deschamps, mining engineer, an injunction.

★Cia. Minera San Roberto y Anexas, S.A., has obtained federal concessions for the working of several mining tracts in the Pitiquito zone, Sonora. The company is reported to be arranging an important development program to start late this year.

★Exhaustion of pay ore knocked out the mining cooperative at Mahuarache, Chih., which was sponsored by Section No. 23 of the National Miners Union. The section asked the Ministry of National Economy to cancel the cooperative's concession. Mahuarache has been abandoned by the cooperative miners and their families.

★Development of a program to soften anticipated hard times for mining in the postwar era has been started by the

WHILE THE BOATS



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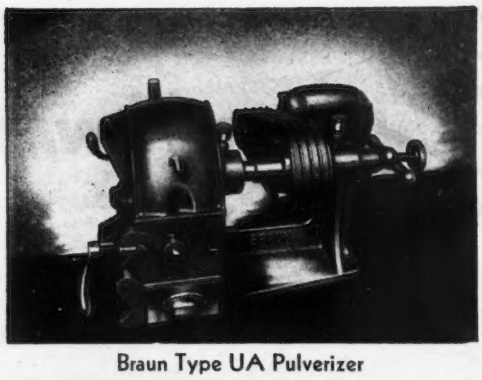

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BULLETIN 551

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Where control of feed improves efficiency—as in weighing feed of ores to ball mills—the Merrick FEEDOWEIGHT gives perfect results. Weighs and Regulates separately. Continuously totalizes weight. Gives better control of grind. Used and approved by leading mill properties. Simple—rugged—"foolproof."

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Mexico (*continued*)

Ministry of National Economy, which has jurisdiction over this industry. The Ministry is frank in saying that mining will face a sharp depression when peace is finally attained, because of a great drop in the demand for its products, especially abroad. The development of the program is being directed by Secretary Gustavo A. Serrano, prominent mining engineer, who was President of the Mining Chamber of Mexico.

★The National Commission for Stimulation of the Mining Industry reports good service and results during the past year for the eight metal-treatment plants it operates in key mining regions for benefit of mining in general but particularly for prospectors and other small-scale miners. These plants are at Altar and Nacozari, Sonora; Guanajuato City, Oaxaca; Tlalapujahua, Michoacan; Mazatlan, Sinaloa; Oaxaca, Alamos, and Tecamachalco.

Daily capacity of the Tlalapujahua plant has been increased from 50 to 100 metric tons and its milling efficiency has been raised by 60 percent. Introduction of an additional cyanidation circuit is expected to double milling efficiency. Operating costs of the plant have been reduced by 13.7 percent, though wages and expenses are higher.

The 10-ton capacity Altar plant has been run at but 40 percent of capacity, because, the Commission said, miners of the region have been rather indifferent to this service. That has caused higher operating costs and losses. Some of the losses, however, have been compensated for by exporting some ore which the plant treats and acquires. The Nacozari plant is almost completed. Placing it into operation is being delayed by electric power scarcity in its region. But when ample power is available the 50-ton plant, which uses cyanidation and flotation, will be run at capacity.

The Oaxaca plant, completed in September, 1943, has not been running at its full 100-ton daily capacity since it started early this year. The plant has prompted more mining work in its region, especially in the Taviche sector. Completion of the Mazatlan plant has been suspended because of the impossibility of installing at its site new machinery acquired for it. Locations are now being chosen for the new plant, which is expected to be at either Acaponeta, Nayarit, or Balsas or Mazcala, Guerrero.

Important service is being rendered by the Guanajuato plant, which has prompted much mining work in its zone, particularly in the San Gregorio region, where alone 3,000 tons of ore has been mined in the past few months.

AFRICA

Wage demand solved amicably—Mines Chamber sets up Social Services Department—New gold field in Orange Free State

★The demand of the Mine Workers Union for a 30 percent increase in wages for all miners has been settled by agreement of the General Council of the Union to accept an offer from the Gold Producers Committee of the Chamber of Mines. The offer, which was accepted by 36 votes to 20, in a secret ballot, is as follows:

1. The Chamber will provide a sum of £100,000 a year for a period of five years from Oct. 1, to be used for the purpose of assistance towards housing, co-operative, or other schemes agreed to mutually by the Chamber and the Union for the benefit of members of the Mine Workers Union, subject to conditions to be laid down by the Union and the Chamber in consultation;

2. The Chamber will make available in addition to the amount referred to in Clause (1) an amount of £25,000 for immediate use for the purposes set out in that clause;

3. Immediately the general council of the Union ratifies this agreement, the union will withdraw its application for arbitration in connection with the dispute arising from the demand of the union for an increase of 30 percent in wages.

4. The Mine Workers Union agrees that neither as a union nor as an affiliated member of the joint mining unions will it make any claim for a general increase of wages or any general

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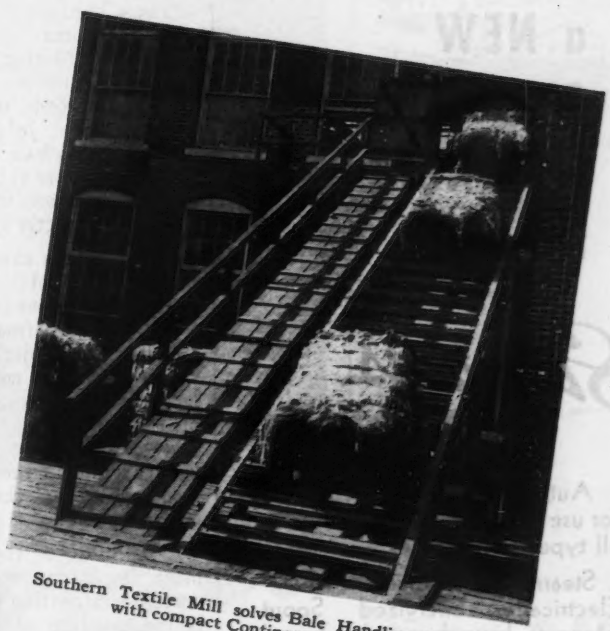

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The efficiency and low maintenance cost of Continental idlers has fully justified the many REPEAT orders from satisfied operators.

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Mine Fan V-Belt Drive from Electric Motor with Auxiliary Drive from Diesel Motor for emergency. Designed and manufactured by Continental.

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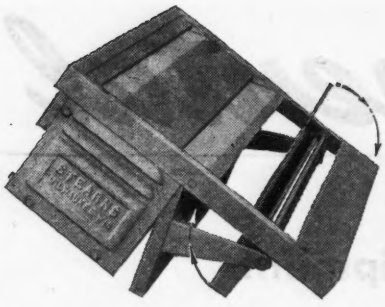

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Africa (*continued*)

claim equivalent to it unless and until existing conditions undergo a very material change;

5. The Gold Producers Committee agrees to maintain the existing minimum wage scale and the present benefits, including those set out in Clause (1) unless and until, compared with the existing position there has been a very material alteration operating to the disadvantage of the mining industry.

The Chamber of Mines has now invited the remaining eight unions comprising the Mining Unions Joint Committee to a meeting to consider extending this agreement to cover all nine unions. The Joint Committee has decided to place several alternative proposals before the Chamber regarding possible methods of enabling members to benefit directly from the offer.

★At about the same time as the wage question was settled, it was announced that the Chamber of Mines had decided to establish a permanent Social Services Department under the direction of a special advisory committee headed by G. Carleton Jones, a former president of the Chamber. A special member-secretary has been appointed to organize this department, which will be responsible to the Gold Producers Committee.

★In addition to the above, one of the most important considerations immediately confronting the mining industry is the position of ex-servicemen, who as a group will need understanding and sympathetic consideration during transition from army to civilian life.

Yet another important matter is that of miners' phthisis beneficiaries, of whom more than 1,200 are employed by the industry. Continual attention is necessary to ensure that these men are placed in work best suited to their capabilities.

★According to official returns of the Union of South Africa Department of Mines the total amount spent by the Union's mining industry last year was £31,759,741, a decrease since 1942 of £3,054,054. In view of the wartime curtailment of gold mining, the amount of the decrease will cause no surprise. Large mines were responsible for £30,910,540 of the total, of which gold mining accounted for no less than £27,620,496 or 89 percent., diamond mines £130,714, coal mines £1,868,455, and other mines £1,290,975.

Most of the mining outlay on stores is on South African products, last year's outlay being £25,355,748 compared with the expenditure of £5,554,792 on imported stores.

★Keen interest in the Orange Free State as a new gold field and in the work done by the African and European Investment Co., which holds the largest proved stake in the district, was expressed by the chairman at the annual meeting held in Johannesburg last month. He stated that:

"To summarize the position from the commencement of drilling operations up

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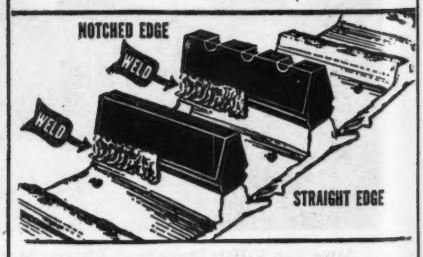

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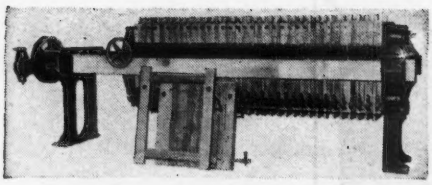

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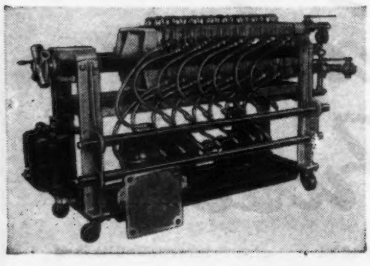


Steam heated, Monel metal, portable filter press. Above—large, open delivery washing filter press.

T. SHRIVER & COMPANY, Inc.
802 Hamilton St. Harrison, N. J.

Africa (*continued*)

to the end of August, 169,806 ft. of drilling (including joint drilling with other companies) have been done, 25 boreholes, aggregating 103,120 ft. of drilling, have been completed in what I call our positive area, and of these 21 intersected Basal Reef, of which 13, or 61.9 percent, gave payable results on that reef, averaging 23.2 dwt. per ton over 17.8 in. corrected width, equivalent to 412 in.-dwt. This positive area has now been proved to extend from north to south for a distance of approximately 10 miles. In addition, we have completed four holes, aggregating 25,426 ft. of drilling, in our negative areas, which areas, as I mentioned before, we are not expecting to contain reef, but which we must, nevertheless, prove before we can consider their abandonment. I may say that our technical advisers consider that no area in this vicinity can safely be abandoned until it has been systematically drilled."

★Interests of the Johannesburg Consolidated Investment Co., in the Free State, is crystallized in the Free State Development & Investment Corp., which is under the technical control of the J.C.I. Co. Arrangements for joint boring and exchange of information have been made with other concerns interested in properties in the Free State.

★Southern Rhodesia produced in July gold and other metals and minerals of the value of £716,967, compared with £697,118 for the previous month. The summary of mineral production in July is as follows: gold (50,360 oz.) £423,020; silver (9652 oz.) £945; base metals and minerals £293,002.

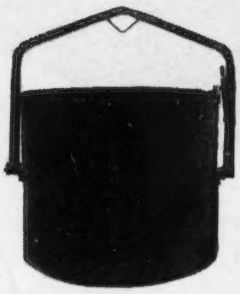
★There were 53 deaths from accidents on gold mines of the Witwatersrand and extensions in August, giving a fatal accident rate for the month (employment at 336,890) of 1.89 per 1,000 per annum, which compares with 1.06 for July and is the second highest rate for the year. Of the 53 deaths 20 were caused by falls of ground. For the eight months of the year to Aug. 31, the fatal accident rate is 1.45.

AUSTRALIA

Central Norseman reopens Princess Royal mine—Big Bell is ready to resume gold mining

WESTERN AUSTRALIA

★During the course of the war a considerable amount of machinery, usually large and small power units, has been removed by the Commonwealth Government from Australian gold mines, of which the majority are in Western Australia. This machinery has been moved to wartime government enterprises, and includes power units, lathes, drills, and other mine machine-shop equipment, to the great detriment of maintenance work at these properties.



Capacity:
26½ Cu. ft.
51⅜" Width
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428 Lbs. Wt.

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A "COMPLETE" Round Tip-over Dumping Bucket with semi-automatic latch.

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This bucket will dump with a slight pull when loaded, right itself and automatically lock in position when empty.

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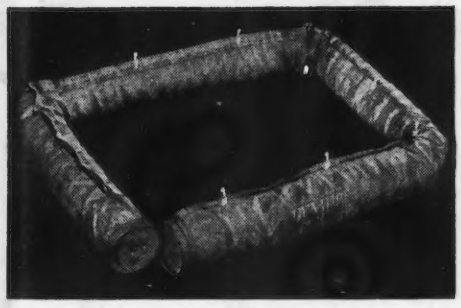
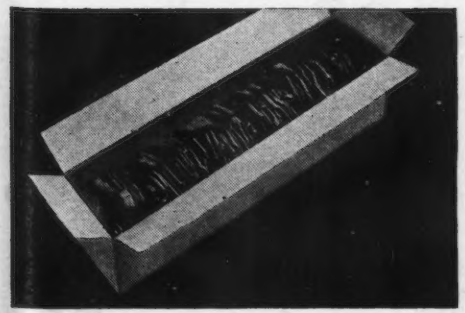
DU PONT NON-COLLAPSIBLE HELICAL-TYPE "VENTUBE"*

HELICAL-TYPE "Ventube" has a tempered steel inner spring that keeps tubing flexible and expanded, maintains maximum air flow.



HELICAL-TYPE "Ventube" bends easily, can be turned sharply in any direction without appreciable reduction of air flow.

HELICAL-TYPE "Ventube" accordion-folds at a ratio of 15 feet to 20 inches. This means easy handling, compact storage.



▶ Here's a *new* work-speeder for all metal mines! Du Pont non-collapsible *Helical-Type* "Ventube" carries cool, fresh air to the working face, and to workers engaged in caving, top-slicing and driving drifts and cross-cuts. And tests by miners show that *Helical-Type* "Ventube" does this job *better by 60%* (at 2½" water suction) than regular non-collapsible "Ventube"!

Helical-Type "Ventube" maintains maximum air flow no matter the degree at which the tubing is bent. Even when doubled back on itself, it will exhaust *8 times more air* than regular non-collapsible "Ventube." Yet, size for size, it *weighs but half as much!*

Learn the many ways in which Du Pont's *new Helical-Type* "Ventube" can serve you! Just clip the coupon below. It will bring you many helpful facts on this time- and cost-saving Du Pont development. E. I. du Pont de Nemours & Co. (Inc.), "Fabrikoid" Division, Fairfield, Conn.

***"VENTUBE"** is Du Pont's trade mark for its flexible, rubberized ventilating duct.

Great stars in great radio plays mean great entertainment . . . tune in "Cavalcade of America"—NBC network—every Monday evening

NOTE: *War Production Board regulations permit us to supply "Ventube" for all mining purposes. To expedite delivery, it is urged that you furnish us with complete priority information on your orders.*

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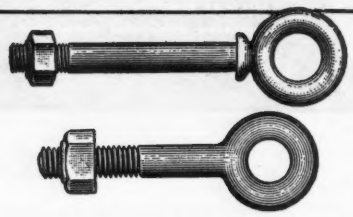
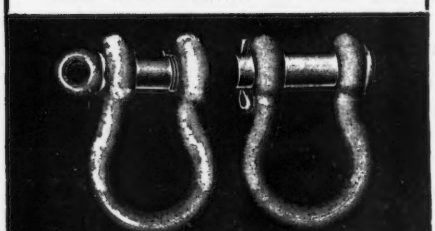


WIDE RANGE OF EYE BOLTS

Laughlin's drop-forged, weldless eye bolts are available in any length or diameter, with or without thread or shoulder. Galvanized or Plain. Stock sizes: ¼" x 2" to 1¼" x 20".



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Distributed through Mining Catalogs

FORGING A SHARE IN VICTORY

THE THOMAS LAUGHLIN Company
PORTLAND 6, MAINE

Australia *(continued)*

At the time of removal it was the intention that the various items would be returned to their owners at the end of the war. Such return will involve heavy freight charges and the cost of re-erection, and, further, it may be expected that the machines have depreciated more or less heavily and that extensive reconditioning will be necessary. It is by no means clear whether these costs will be met by the owners or by government. As the acquisition of the machines was to meet conditions of national emergency, it is a reasonable supposition that their restoration and reconditioning would be a fair charge on the government and not on private individuals. There has been a recent government announcement that a committee has been formed to undertake return of machinery to the mines and that orders will be placed with overseas manufacturers for such items as cannot be made in Australia.

★Much interest attaches to future operations of Central Norseman Gold Corporation N.L., in the reopening of the old Princess Royal mine, north of the company's leases on the Norseman gold field. In the early years of the district, the mine was worked to a depth of 950 ft. and up to 1918 produced 144,170 oz. of gold from 169,585 tons of ore. The lode has a length at surface of 1,500 ft. and dips east at 45 deg. The average width is under 10 ft., with maximum widths approaching 20 ft. The greater part of the production was from above 400 ft. from surface, but it is reported that a large tonnage of low-grade ore exists below that horizon, and that the 950 ft. level was the strongest horizon and gave the best appearance of permanence of any in the mine. The lode occurs in hard, pyritous amphibolite traversed by felsite dikes. The bulk of the gold in the Princess Royal mine was obtained at or near the contacts of the lode and the felsite dikes, which have a nearly similar strike to the lode but are practically vertical. Sampling has begun at the 950-ft. level, and values averaging 7 dwt. gold per ton over a width of 60 in. have been reported between 130 ft. and 200 ft. in the north drive. An area of 600 acres has been taken up on the extension of the line beyond a norite dike which cuts off the Princess Royal shears, and geological work and surface prospecting is in progress.

★Big Bell Mines, Ltd., in the East Murchison gold field, are ready for an early resumption of operations at the end of the war. When work commenced in 1937, ore reserves of 3,000,000 tons assaying 3.7 dwt. gold per ton had been developed; to the end of 1942, when the company was forced to close down through labor shortage and difficulties in obtaining stores, 286,395 oz. of gold and 98,399 oz. of silver had been recovered from 2,199,860 tons of ore. The greater part of this output came from the glory-hole workings to a depth of 250 ft. from surface. Below that horizon there is a slight fall in

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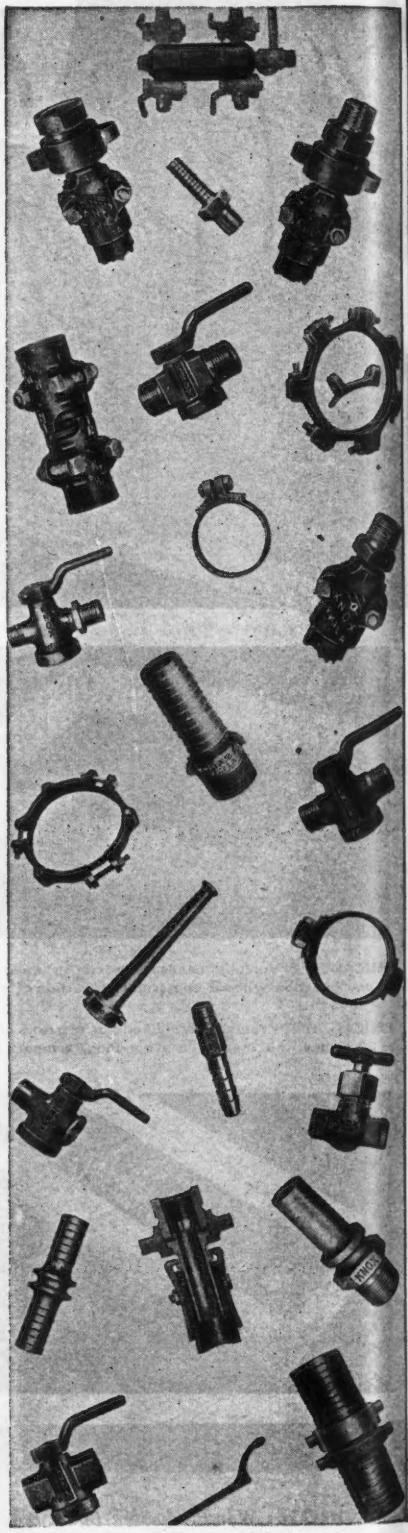
CATALOG



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More helpful than ever, now that war deferred maintenance must be reckoned with, Crane *complete* piping materials service simplifies every step of piping rehabilitation. One reliable source—your Crane Branch or Wholesaler—supplies everything you need, be it a single fitting or a complete new system. In brass, iron and steel materials for all power and process piping applications, the Crane line provides the world's most comprehensive selections.

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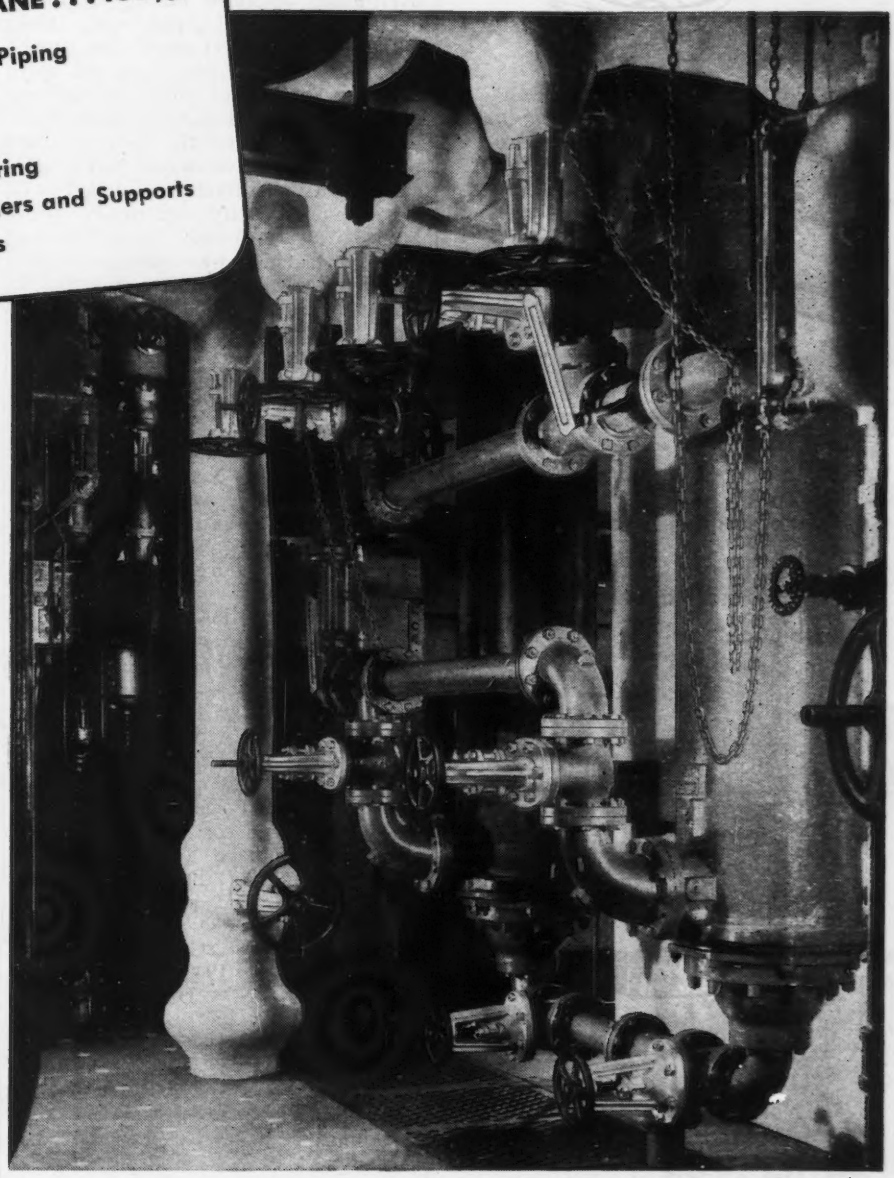
The same high quality protects every part of piping systems when Crane materials are used throughout. In Crane Steel Gate Valves, for example, straight-through ports permit unrestricted flow. Severest line stresses are overcome by sound and rugged body castings. Smooth operation is maintained by a ball joint type stuffing gland, strong tee-head disc-stem connection, and ample stem bearings. Positive seating is assured by extra long disc guide ribs.



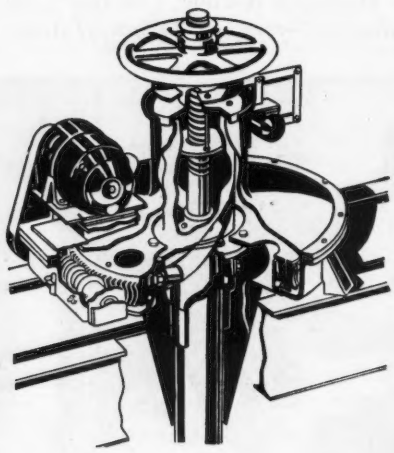
Installation in Industrial Power Plant

CRANE

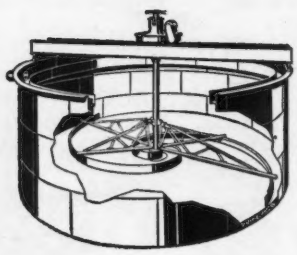
VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

"Auto Raise" Thickeners

The mechanism that prevents overloads from damaging the driving or scraping mechanism.



The scraping mechanism consisting of two complete spirals removes the settled solids in one revolution.



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HARDINGE
COMPANY, INCORPORATED - YORK, PENNSYLVANIA
NEW YORK, CHICAGO, SAN FRANCISCO, TORONTO

Australia *(continued)*

grade and recoverable value is about 2.85 dwt. gold per ton. The lode, which has a slight eastern dip, is about 120 ft. wide and has been opened up for a length of 1,500 ft. Output was at the rate of 40,000 tons of ore per month treated by cyanidation.

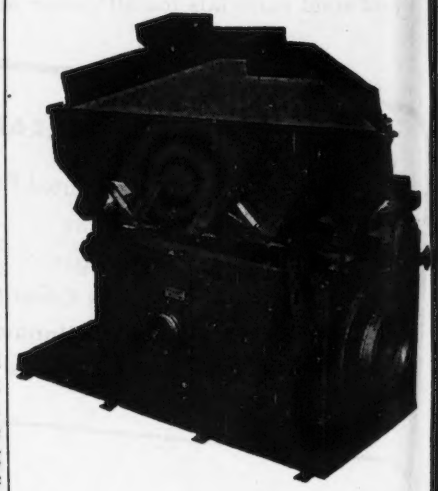
QUEENSLAND

★In the year ended June 24, Mount Morgan, Ltd., met numerous difficulties and incurred a loss of £A122,580. This result was largely due to shortage of labor, which restricted development work in the open cut and hampered the production of reserve ore, the output of which was 51,000 tons less than in the previous period. The greater part of the ore milled came from outside the reserves and consisted of auriferous overburden obtained during stripping operations at the open cut. This material was of lower grade than usual. Ore reserves were drawn on for only 19.5 percent of the total ore milled. More modern and efficient equipment is being provided for the open cut, but war conditions have caused much difficulty in its manufacture and delivery. Two large capacity electrically operated shovels were ordered from England and one machine was delivered about two months ago, but immediately on arrival it was commandeered by the Coal Commission, and another long delay must ensue before it can be replaced. Six shovels are working on overburden removal and the ratio for the period averaged 1.26 tons of overburden to 1 ton of sulphide ore treated. Both No. 1 and No. 2 mills were in operation. There was a general improvement in the nature of the material treated, with the result that lime consumption was reduced by 16.7 lb. per ton. Lower gold and copper values were reflected in lower recoveries, but tailings assays showed improvement. No. 3 mill was operated on sulphide tailings. Recoveries were: gold, 96.82 percent; copper, 95.19 percent. Costs were affected by a decrease in output of 300,000 tons and by the harder nature of the ore obtained from the lower benches. Power costs were higher due to increased cost of coal from the company's colliery and also to the lower output of ore. Comparative costs for the 1943 and 1944 periods were:—

	Costs per Ton			
	1943		1944	
	S.	D.	S.	D.
Sulphide ore:				
Mining	8	7.94	7	11.21
Treatment	5	1.66	5	0.28
	13	9.60	12	11.49
Sulphide tailings			1	3.59
Mining: total material mined	3	0.46	3	6.04
Smelting: per ton copper	£21-8-9.26		£25-15-6.60	
Power: per kw.-hr.	0.5410d.		0.5856d.	

Which is NOW First-

Plain Tonnage or Higher Quality?



Maximum recovery of higher purity product is now more important than plain tonnage output. Production men today are looking for higher analysis of concentrate—increased recovery from the mill feed—rathe than greater tonnage capacity.

Dry tabling will take any concentrate between a maximum of ¾ inch and a minimum of 100 mesh (when properly graded) and improve its quality.

Our engineers will be glad to help solve your separating or concentrating problems and submit recommendations. Send sample for laboratory tests.

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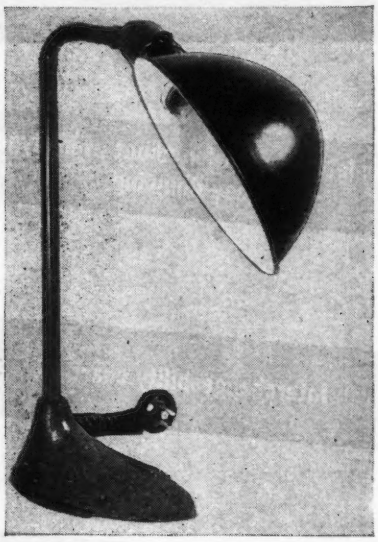
EQUIPMENT NEWS

Lamp for Inspecting Shop Work

A line of portable inspection lamps, one type of which is herewith illustrated, has been brought out by Reliance Devices Co., New York. These lamps are mounted on a 2-lb. base so that they



will not tip over. The socket rotates 350 deg. horizontally and adjusts 180 deg. vertically. It requires no wing nuts or setscrews for adjustment.

The unit will not work loose or drop down, regardless of the number of adjustments and vibration. Its base has three wood-screw holes, permitting the entire unit to be "pinned up" if desired.

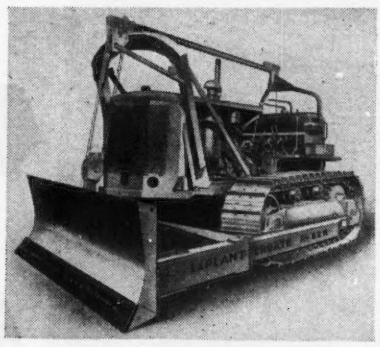
Lubricator for Air Tools

Developed as a device for providing proper lubrication of pneumatic tools, the Arnold lubricator, manufactured by the Rucker Equipment Co., 300 17th St., Oakland, Calif., is equipped with a feeder that can be easily adjusted to deliver steadily to the tool any desired mixture of oil and air. Built of Dural alloy No. 365, it combines durability with light weight. The three sizes in which it is made weigh 13 oz., 27 oz., and 65 oz., respectively, the corresponding oil capacities ranging from one sixth of a pint to a full pint. The reservoir can easily be filled under line pressure.

The lubricator is designed on the dash-pot principle and has no needle valve or other parts to wear. In size, the smallest of the three models is 2 in. diameter by 4 in. long, and the largest 4½ in. diameter and 10 in. long. Pipe size of the smallest is ¾ in.; that of the other two, 1 in. Reducers can be used with all three. The oiler will operate in any position, and, being of smooth contour, can be dragged around an obstacle.

Earthmoving Unit

LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Ia., has brought out a new earthmoving unit, designated Trail-builder. It is a single cable-operated unit designed for mounting on a Cater-



pillar tractor. Retaining the structural features of this company's line of bull-dozers, the unit is of welded steel construction, box channel frame, box plate blade, pressed and formed sections. The cutting edge has been reinforced and the front overhead is of new design. The three-position blade can be angled right or left, and tilted up or down with a variation of 14 in. It can be raised a maximum of 50 in. or dropped 72 in. below the ground line.

New Half-Yard Shovel

Koehring Company, Milwaukee 10, Wis., has announced a half-yard shovel, convertible to crane, dragline, or pull shovel. It is also available as a cruiser crane mounted on rubber tires, and can be furnished for truck mounting. Orders are being accepted on a priority basis for shipment when present military needs are terminated. This postwar model is one of many that Koehring will have available for civilian requirements. It is known as Model 205. Many new features have been incorporated for greater speed, increased production capacity, easy operation, low maintenance costs.

Outstanding design improvements are: same boom for shovel or pull shovel operation; trigger-fast dipper trip; independent unit traction gear case; easily removable machinery units; instant travel reverse; spacious walk-around area; and ample head room in all parts of cab.

Electrode Holder

Jackson Products, Detroit 7, Mich., has brought out an arc-welding electrode holder that embodies new features, outstanding among which is its lightness. The new models show a weight reduction of 40 percent compared with older types. The holder is of tong type, with tongs of tough, light-weight alloy and copper jaws easily replaceable. A new pivot hinge provides a simple and quick method of knock-down and assembly. Cable connection is mechanical.

INDUSTRIAL NOTES

LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa, has received its fourth **Army-Navy "E"** award for outstanding production of earthmoving equipment.

Mine Safety Appliances Co., Pittsburgh, Pa., is the recipient of the **Army-Navy "E"** award for outstanding achievement in production.

Universal Engineering Corp., Cedar Rapids, Iowa, has appointed **D. H. Young,** New York 5, N.Y., director of exports for the company's crushing and auxiliary equipment.

O. R. Kuster has been appointed chief project engineer of General American Process Equipment with headquarters at the New York office, 420 Lexington Ave.

G. C. Rasey is supervisor of the diesel division of the General Sales Department of **Joshua Hendy Iron Works,** Sunnyvale, Calif.

Carborundum Co., Niagara Falls, N.Y., announces the appointment of **W. T. McCargo** as Eastern Regional Sales Manager, and of **Francis D. Bowman,** who becomes Director of Public Relations.

Henry Barnhart, formerly manager of the Shovel and Crane Division of **Lima Locomotive Works, Inc.,** Lima, Ohio, has been made vice president in charge of the Shovel and Crane Division. **Paul R. Ehrgott** becomes general manager of the division. **Albert Jay Townsend,** chief mechanical engineer of the

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Maximum recoveries on base metal ores are obtained with Bear Brand Xanthates in mills throughout the world. Their superior collector power and selectivity are universally recognized.

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THE DOW CHEMICAL COMPANY

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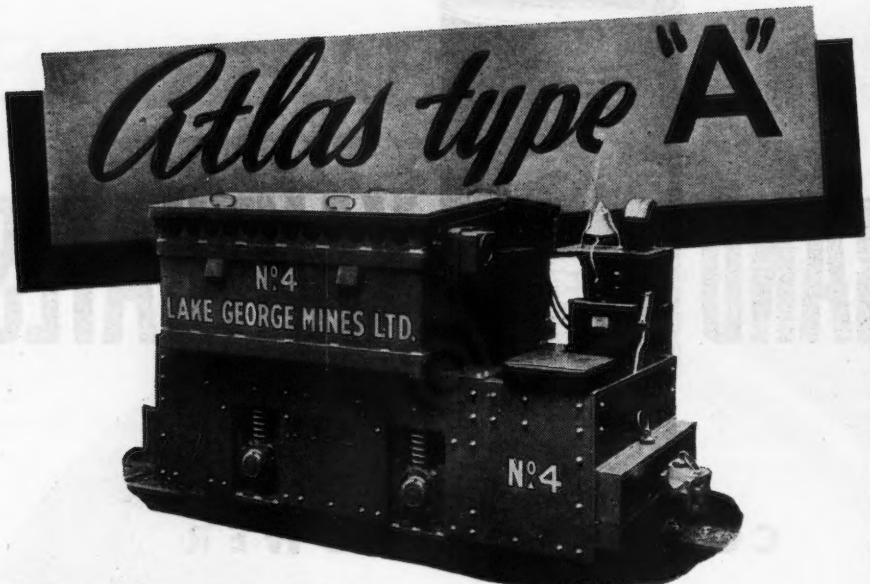

• Designed to efficiently handle main line haulage operations in metal mines, the ATLAS "A" locomotive is supplied in 3 and 4 ton sizes, for 18 inch or wider track gauges. Desirable construction features include the ATLAS patented Double-Reduction Spur Gear Drive.

Canadian Representative—Mine Equipment Company, Kirkland Lake, Ont.—International Agencies & Machinery Co., Ltd., Vancouver, B.C. —BMS Limited Industrial Stand 223 Lower Germiston Rd. Jupiter Johannesburg, So. Africa

THE ATLAS CAR & MFG. CO.
★ **CLEVELAND 10, OHIO, U.S.A.** ★

company, has been appointed vice president in charge of engineering.

Charles F. Hall, formerly president of **Acme Equipment Co.,** Allison Park, Pa., has opened offices in the **Bessemer Building, Pittsburgh 22, Pa.,** where he will deal in mining and industrial contractors' equipment.

Leslie E. Howard has been appointed sales engineer for the Spokane and Salt Lake City territories of the **Gould Commercial Division, National Battery Co.** He will make his headquarters in Spokane.

R. G. LeTourneau, Inc., Peoria, Ill., has assigned four representatives to assist LeTourneau dealers in South and Central America. **William Brumback,** with headquarters in Mexico City, will be assisted by **Alexander Kulai. L. R. Dixon,** traveling through South America, is assisted by **Boge Livengood,** who at present has his headquarters at Rio de Janeiro.

Oscar C. Gruender has been appointed consulting engineer of the crusher and screen division of **Nordberg Manufacturing Co.,** with offices in the **Wisconsin Tower Bldg., Milwaukee, Wis.**

W. A. Meyer has been appointed manager of dealer sales for **Allis-Chalmers Mfg. Co.,** succeeding **S. H. Gorham,** resigned. Mr. Meyer has been particularly active in the field of multiple V-belt power transmission, and is president of the **Multiple V-Belt Drive Assn.**

Pioneer Engineering Works, Inc., Minneapolis, Minn., has appointed two Eastern representatives: **Anderson Engineering Co.,** Cambridge, Mass., for the New England states except Connecticut and the four western counties of Massachusetts; **Tyler Equipment Co.,** Springfield, Mass., for Connecticut (except Fairfield County) and the four western counties of Massachusetts.

Lucien W. Moore has been appointed manager of valve, fitting, and pipe sales by the **Crane Co., Chicago, Ill.** He is succeeded as purchasing agent by **Thomas J. Hanlon.**

W. K. Cox, formerly sales manager of the eastern division of **Caterpillar Tractor Co., Peoria, Ill.,** has been appointed assistant general sales manager. He is succeeded in his former position by **William S. Ziegler. F. D. Haberkorn,** formerly the company's representative in Texas and Oklahoma, will be assistant sales manager of the eastern division.

Mack Trucks, Inc., announces the appointment of **William M. Kauffmann** as assistant to the chief engineer, in charge of diesel engine development.

James L. Dunn, assistant plant manager of the Bridgeport plant of **Jenkins Bros.,** has been promoted to the position of vice president in charge of industrial relations.

BULLETINS

Speed Reducers. Philadelphia Gear Works, Inc., Philadelphia 34, Pa., has published a new 56-page bulletin, No. 200, describing and illustrating spiral level speed reducers.

Rear-dump Trucks. A 24-page brochure by Euclid Road Machinery Co., Cleveland 17, Ohio, showing use of rear-dump Euclids in the mining industry.

Control Instruments. Leeds & Northrup Co., Philadelphia 44, Pa., has issued a publication which briefly describes all of its products for the control and regulation of industrial processes.

Welding Electrodes. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., has just issued a bulletin, L6348, describing the company's line of arc-welding electrodes.

Tire Data. B. F. Goodrich Co., Akron, Ohio, will send upon request a copy of its operator's handbook. An important section deals with eight factors effecting truck tire life.

V-Belts. A new handbook covering industrial applications of V-belts, with extensive engineering data, has been published by B. F. Goodrich Co., Akron, Ohio.

Rock Drills. Ingersoll-Rand Co., New York 4, N.Y., has published Form 4032, a 12-page bulletin, entitled "Raise Production With Ingersoll-Rand Stopehamers."

Safety Ladder. Duo-Safety Ladder Corp. Oshkosh, Wis., will send on request a 4-page bulletin describing its new line of duralumin extension ladders.

Vibrating Screen. The Denver-Dillon "Floating Circle" vibrating screen is the subject of Bulletin S 3-B5, issued by Denver Equipment Co., Denver 17, Colo.

Concentrating Table. Denver-Wilfley concentrating tables in both standard and laboratory sizes are illustrated and described in bulletin No. T1B1, issued by Denver Equipment Co., Denver 17, Colo.

Respiratory Protection. E. D. Bullard Co., San Francisco 3, Calif., will send on request a new circular entitled "Guide to Selection of Respiratory Protection."

Dredges. American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill., has just released Bulletin No. 844-D illustrating the part played by manganese steel in the operation of all types of dredges.

Industrial Research. Battelle Memorial Institute, Columbus, Ohio, has issued a brochure illustrating and describing its facilities for industrial research, much of which is of direct interest to the mining industry.

Flat Spray Nozzles. Bull. 459, Chain Belt Co., of Milwaukee, Wis. For washing and cleaning mineral products.

Post War Prospects. A booklet prepared by Hamilton Bridge Co., Ltd., Hamilton, Ont., Canada. Available on written request by U. S. manufacturing executives interested in establishing agencies in Canada for the production of metal goods.

V-Belt Drive. A 48-page pamphlet by the Multiple V-belt Drive Assn., Chicago 3, Ill. Entitled "From the Shadoof to the Dominant Drive," outlining the history of power transmission.

Fire Pumps. Bulletin B6336, Allis-Chalmers Mfg. Co., Milwaukee 1, Wis. describing a new line of single-stage, double-suction fire and booster pumps, with capacities ranging from 500 to 1,500 g.p.m.

Fuse Pullers. Trico Fuse Manufacturing Co., Milwaukee, Wis., has issued Bull. 5-A illustrating and describing a tool for safely removing and replacing fuses, eliminating danger of shock and burn.

Car Dumpers. A 24-page catalog of Nolan rotary car dumpers, trip feeders, dumping cages, and auxiliary devices. Mining Safety Device Co., Bowerstown, Ohio.

Diesel Engines. Caterpillar Tractor Co., Peoria, Ill., has prepared a new booklet, Form 8657, illustrating the varied applications of Caterpillar diesels in the mining and other industries.

Ball-rod Mills. Bull. B2-B4 of the Denver Equipment Co., Denver 17, Colo., covers design and application of Denver ball-rod mills. Engineering data and a ball-mill slide rule are included.

Diesel Power. One bulletin on generating sets and another on pumps powered by diesel engines of R. H. Sheppard Co., Hanover, Pa.

Screens. Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., will send on request Bull. B6330, on low-head horizontal-vibrating screens.

THE FAR EAST

Frontier for American Enterprise

IN THE great tradition of America, our frontier lies to the West. But for a United States that stretches from the Atlantic to the Pacific, to Go West is to arrive in the Far East. The feet of literally millions of our young men are now set upon that route.

Accomplishment of their objective—the defeat of Japan—will not end our responsibilities to the Orient any more than the defeat of Germany will end our responsibilities to Europe. This time we mean to see the venture through.

The first sketch of a political program for enlisting the strength of nations of good will to enforce the peace was drawn at Dumbarton Oaks. That is a good start. But those who participated know how much work remains before the blueprint becomes a fully matured plan, the plan becomes a structure, and the structure takes life and effective being in the living imagination and will of the peoples of the world.

No political accord, however high its purpose, can endure for long if it depends upon the loyalty and support of populations embittered by hopeless poverty that is offered no promise of relief. The poisonous dust of mass despair makes inevitable an ultimate explosion, whether it be sparked by a torch supplied from without or by its own internally generated heat. Much of the Far East is sufficiently close to that position to pose a grave problem to the Western world. It is of particular importance that American business men and workers alike recognize the nature of their responsibility in the matter, for to them the great area of the East presents also an opportunity and a challenge.

☆ ☆ ☆

The Orient—stretching in a vast semicircle from Manchuria and Japan to India and Ceylon—is the home of more than a billion people, the world's greatest potential market. In its mountains are the earth's richest stores of tin and mica; its deposits of iron ore, coal, and manganese rival those of France, Russia, and the United States. Its rice paddies are the most productive in the world, its coconut and rubber plantations the largest, and its cotton production is of major volume.

And yet, this fabulous region—with its riches of manpower and raw materials—suffers from living standards at the lowest rung of the world scale. With as much as 85 per cent of the populations of this great area devoted to the production of farm products, starvation has been an endemic plague to countless millions of its inhabitants, and will remain so until they graduate from the crudely primitive methods of the crooked stick and the bamboo plow to the use of the implements of a modern world in both agriculture and industry.

The improvement of agricultural methods and the burgeoning of industrial development depends upon tools—a preponderance of simple tools, no doubt, at the beginning, for modernization of economic processes is a development that cannot be forced at a rate faster than the ideas upon which they depend can be developed. If we, in the United States, are to hope to supply a major portion of the implements upon which the salvation of the East depends, we must be prepared to export also the skills and technologies which will make their effective use possible.

The possibility of a world market for machinery and manufactured products is a challenge that American industry cannot afford to ignore. The United States will emerge from the war with almost half of the world's industrial capacity within its borders, with much more than half of the heavy industries. Drastic and painful readjustments are inevitable; but they can be mitigated to the extent that we can find outside markets for the products for which we have excess capacity.

We shall find ourselves, at war's end, in a singularly favored position to compete in any equipment markets which are open. It is not merely that we shall have the productive capacities crying for outlets. Aside from Germany and Japan, which for some time will not be in a position to compete, our two major industrial Allies, Great Britain and Russia, will face enormous tasks in providing for their own rehabilitation. Neither of them is likely to be in a position to export more capital than they absorb; and although Canada, Sweden, and Switzerland will be, the United States will stand alone as the one major creditor nation in the world. If the potential advantages of this position are managed with wisdom and imagination, they will enormously enhance our opportunities for supplying a great share of the capital goods demand of undeveloped areas.

☆ ☆ ☆

What is the dimension of the Far East's potential demand? What are some of the difficulties standing in the way of its being realized?

If needs were the only measuring stick, the Far Eastern market would provide a bottomless pit into which even the great stores of our exportable capacity could be poured with room to spare.

China, alone, with its teeming population of 450 millions, has spelled out needs in dimensions large enough to stir the imaginations of the equipment producers of the world.

Business Week (February 5, 1944) supplements Dr. Sun Yat-Sen's spacious first estimates of the requirements for a thorough-going industrialization program with figures provided by current Chinese planners—25,000 locomotives; 300,000 freight cars; 20,000 passenger coaches; 20,000,000 tons of steel; and 90,000 power driven machine tools for the first five years of reconstruction. An American manufacturer of farm equipment, who recently surveyed the agricultural requirements of China, estimates an ultimate Chinese market for 20,000,000 tractors.

India's drawing-board plans are equally expansive. According to the bold pattern drawn up by a group of Bombay industrialists—some of whom are due to visit the United States early in 1945—India, after the war, will require a capital investment of $2,000,000,000 a year over the next 15 years, of which $250,000,000 per year for the first seven years will be in the form of imported capital goods.

Included on the huge import order list of the Bombay executives are mining, roadbuilding and power station equipment, heavy locomotives, metallurgical plants, agricultural machinery, and a long list of machine tools.

There can be no question of the need of these countries for the industrial equipment—and for many items of manufactured goods—which we are so eminently in a position to supply. But realism requires that we measure this demand against the Far East's probable capacity in the relatively near future to absorb industrial goods.

A Chinese economist has estimated that China, in 1937, had a total industrial capital investment of about $1,000,000,000 in American values, or something like $2.50 per capita of population. In contrast, the American investment, in manufacturing facilities alone, is now more than $600 per capita.

What it could mean in terms of capital goods requirements if China alone carries out this dream of modernizing, not to the utopian level of the United States but to the present modest level of the less developed Soviet Union, is typified by measuring just three lines: 500,000 tons of steel a

year, for five years, to add 12,500 miles to the railroad system; 2,187,500 motor vehicles; 3,300,000 telephones.

But it is one thing to cite mountainous figures demonstrating needs. It is another, and far less optimistic exercise, to find assurance that practical opportunities for satisfying such needs can be made to materialize. Let us face some of the major difficulties and see if they are insurmountable.

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The first hurdle to be cleared is the question of whether or not we want to promote the industrialization of the Far East. The wisdom of doing so has been vigorously challenged. The negative argument, on the economic side, generally runs thus: If we provide industrial equipment to backward economic areas, we deprive ourselves of the greater long-run opportunity of selling them manufactured articles which our aid has enabled them to produce for themselves.

It is only fair to say that such a thing might happen—that it has happened in isolated instances in the past. But the overwhelming weight of economic history demonstrates that the broader attitude is also the profitable one.

The United States itself is the living refutation of the fear which now cramps the outlook of many of its own citizens.

From 1790 until 1850 the foreign trade of our new fledged Nation had many of the characteristics which pertain to the trades of China and India today. We imported manufactures and we exported raw materials, agricultural products, and newly mined gold. Our imports exceeded exports, the difference being made up partly by payments to us for shipping services and partly by industrial development loans. It is relevant to inquire how the trade of the lenders was affected by this policy of supplying us with industrial capital and machinery.

From 1850 through 1939 the pattern of America's foreign trade changed. Slowly at first, and then at accelerated pace, our import ledger showed a percentage decline in manufactured goods and a percentage rise in raw materials to feed our expanding industrial facilities. But while finished manufactures declined percentagewise in our import budget, so great was the increase in our total foreign trade operations in the century from 1830 to 1930 that our imports of manufactured goods increased more than twentyfold, and they more than doubled between 1900 and 1939.

Clearly industrial Europe gained rather than suffered from the industrialization of the United States, and it is equally clear that we, in turn, shall benefit from the industrialization of the world's undeveloped territories. Further evidence is provided by Canada which, with its high industrial development but only 12 million people, buys from us each year almost as much as the relatively unindustrialized 130 million people south of the Rio Grande.

If it be granted, as I believe it must, that the development of Far Eastern countries will be to our advantage as well as theirs, the second question that we should face is the speed with which it can be accomplished. Is there genuine promise in the proximate future of opportunities for American enterprise of the magnitude set forth in the estimates quoted above?

In all fairness, I am forced to state my conviction that the road is longer than is indicated by Chinese and Indian leaders. It is natural, and far from censurable, that their eyes should be focussed upon the urgency of national needs, rather than upon obstacles in the way of their fulfillment.

On the other hand, it is possible that our own long process of industrialization may lead us to conclusions of undue conservatism. Ideas, once they break the crust of resistance are the most contagious of bacteria, and the tempo of their infiltration seems to increase by geometrical progression in a world of swift communication.

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In an interesting recent study of The International Labor Office, it is suggested that the general economic level of the rest of Asia outside Japan in the late 1930's was not dissimilar to that of Japan in 1900. Between 1900 and 1936, Japan increased its total capital investment more than threefold devoting between 10 and 17 per cent of its annual income to capital outlays. A comparable tempo of development for China, India, and other Asiatic areas would result in a capital expansion that would dwarf to insignificance the most optimistic blueprints that have been put forth to date. I am not suggesting this as a likely possibility, but rather as a caution lest we, in the name of hard-headed realism, underestimate Asiatic potentials as much as their own nationals exaggerate them.

Finally, in appraising the outlook for American enterprise in Far Eastern markets, we collide, head-on, with the problem of how we are to be paid. Here, hard-headedness can be only a virtue, for the lack of it will breed inevitable disaster for the Asiatics as well as for us.

In the last analysis, the dimension of the American market in the Far Eastern countries will be determined by the dollar exchange at their command, obtained through the products, goods, and services which they are able to provide to us, with due allowance for multilateral trade arrangements. It is true that the balance temporarily can be distorted through the extension of developmental loans. There is little question but that such loans will be in order after the war, and if they are wisely made, for productive projects that eventually will increase the exporting capacities of the countries to which they are extended, they can be thoroughly justified. But the best loans provide only a temporary expedient. In the long run, the balance of current payments must be restored with sufficient margin to provide interest payments and finally amortization of principal.

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How, then, are we to attack the problem of increasing our imports from the Orient?

In 1937, the total exports of the Far East amounted to something over $5,000,000,000—a little less than $1,500,000,000 in foodstuffs, a little more than $2,500,000,000 in raw and partly manufactured materials, and better than $1,000,000,000 of manufactured articles. Of this total, the United States purchased only about 20 per cent—approximately 10 per cent each of the foodstuffs and manufactures, and 30 per cent of the materials.

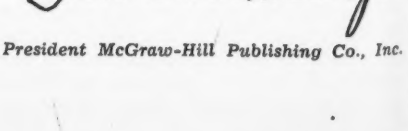
Despite changes in our technologies which will probably reduce our future takings of such important items as rubber and silk, the achievement of a high level of economic activity in this country after the war will provide a basis for increasing our Eastern imports, but only if it is an accepted part of our national policy to do so.

This means an alert and aggressive exploration of two-way trade possibilities on the part of both American business and our governmental agencies. It cannot be done by either alone.

The war has dislocated many of the trade patterns that prevailed in the past. The East is hungry for the type of products which we, uniquely, are situated to supply, but it will make its bargains with those who will not only fill its needs but will also provide outlets for its produce. Even the prewar magnitude of the exports from this area provides ample margin for the most meticulous and imaginative shopping of Eastern markets with the aim of increasing the modest share of our prewar purchases. And a farsighted program of development loans can greatly increase the capacity of these countries to produce what we want.

In general, we can trust American enterprise to explore rigorously all likely export opportunities. But the equally vigorous investigation of import possibilities will require a break from past traditions on the part of American business and American government.

Both East and West must learn to think in new patterns for the successful opening of a new frontier.



President McGraw-Hill Publishing Co., Inc.

THIS IS THE 30TH OF A SERIES

RUSSIA

Threat . . . or Promise?

WHEN this war is ended, two nations—the United States and Russia—will possess the bulk of the world's military and industrial might.

Whether this new situation will hold seeds of catastrophe or of unprecedented opportunity will be determined by policies . . . still to be formulated.

If this concentration of power leads to a bitter struggle for supremacy, then the world will be turned into a giant munitions factory.

If it is used cooperatively to maintain order, then, I believe, the stage is set for a long era of prosperity . . . and peace.

It is time that Americans, whether of the Right or the Left, face this basic issue squarely and open-mindedly.

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No group in this country has a greater stake than have business and industry in seeing that a satisfactory Russian-American understanding is reached.

Without such an understanding there can be no reasonable hope for more than a temporary and insignificant reduction of our crushing wartime tax burden. If the threat of a clash between these two giants impends, neither bankers nor governments will run the risk of lending on a scale adequate to maintain international trade at levels necessary for our future prosperity. Potential international customers, instead of buying freely in open world markets, will be forced—as during the dangerous period introduced by Hitler in the early 1930's—into the trading camp of whichever power they fear most.

If, however, Moscow and Washington will agree on cooperative plans for maintaining the peace, American business will enjoy enormous new trade opportunities after the war.

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Russia, during the three and one-half years since it was attacked by Hitler, has conclusively proved to a doubting world that it is a top-flight military power.

Soviet railroads did not break down under the strain of war.

Regions accounting for nearly 70 per cent of Stalin's key industries were engulfed by the invading Nazis, but before they fell, Soviet management engineers performed a near miracle by transplanting entire industries a thousand miles to the Urals with the loss of as little as four months' production in many cases.

Though American planes, trucks, and medical supplies have been welcomed by Moscow, fairness demands the admission that more than 98 per cent of American production has *not* gone to the Russian front.

Russian planning and *Russian* equipment won the victories of Leningrad, Stalingrad, and the Caucasus.

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But these measures of Soviet military strength—indicative as they are of an unsuspected economic development—fail to picture in adequate detail the startling potential of the Russian market after the war.

Russia, for instance, has two and one-half times the area of the United States.

It has a population of nearly 200,000,000, and this is increasing at the rate of 2,500,000 a year.

And statistics just released show that Russia has three times as many youngsters under 16 as has the United States. This is a measure both of war potential and of a vast commercial market.

And remember that in no part of the world before the war was per capita production rising as rapidly as in the Soviet Union.

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German armies occupied a region in Russia roughly equivalent to the territory in the United States north of Richmond, Virginia, and east of the Mississippi.

This huge area—with its counterparts of Pittsburgh, Buffalo, and Bridgeport; of Illinois corn fields, New York dairy farms, and Maine potato harvests—was *twice* subjected to the most withering destruction; first by the Russians themselves when they retreated before the Germans, and then by the Germans when they withdrew before the victorious Russians.

As a result, 30,000,000 people are in urgent need of complete reoutfitting. They need houses and shoe laces, trolley cars and baby carriages, tractors and livestock, hydroelectric plants and electric light bulbs.

Many of these needs will be met at home. It is doubtful, for instance, if Moscow will import cooking utensils or sewing machines, for many of Russia's huge war factories can quickly be converted to peacetime production of such consumer goods.

But for the rebuilding and expansion of her industries Russia looks to the United States for equipment.

Soviet representatives already are in this country with authority to negotiate for technical men and the equipment necessary to rebuild the great Donbas coal mines according to the most modern American methods.

It is important to remember that Russia's whole iron and steel industry, its non-ferrous mining and processing, some of its chemical production, much of its coke roasting and gas recovery, practically its entire automobile and tractor industry, and the largest of its hydroelectric plants, are based on American machinery and processes.

It is known among manufacturers that Russia recently has asked for bids on shipbuilding equipment, construction and roadbuilding machinery, alloy steels, textile machines, plastics, and a long list of rail, air, and water transport supplies.

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The Soviet Union, however, has more than a rehabilitation job on its drawing boards.

The first Five-Year Plan, which, as we all remember, was completed ahead of time in 1932, was devoted almost exclusively to heavy industry. Russia set out to build for itself the machines and the factories which, in later years, could turn out, at home, modern equipment for a vast range of light industries.

Stalin, when he inaugurated the second of his famous Five-Year Plans, promised that before it was completed Soviet factories would begin to turn out a flow of con-

sumer goods—ready-made dresses, canned foods, soap, cosmetics, shoes, kitchenware, automobiles, telephones, and modern houses.

But, by 1935, Moscow realized that Russia could not afford to enjoy such luxuries in the face of growing political tension in Europe. So, when the third Five-Year Plan was launched, there was no fanfare. Russians continued to wear their old clothes, to eat whatever simple food was available, and began grimly to build the industries which ultimately produced enough tanks, planes, and guns to turn the tide of battle at Stalingrad.

It is characteristic of Moscow that even before the last battles with the Nazis are over, Russia is planning to pick up its Five-Year Plans where the war had interrupted them.

Invitations to participate in a permanent exhibition in Moscow already have been mailed to American manufacturers. Soviet officials want their public to see samples of our new machine tools, aluminum and alloy products, oil-drilling machinery, bulldozers, and prefabricated kitchen equipment. Russia already is projecting specific plans to resume the job (1) of making the country an industrial giant comparable to the United States, and (2) of making life more pleasant for a long-suffering people.

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What is the measure of this postwar market in the Soviet Union?

Some estimates place the total quantity of goods which Russia might take from the United States during the first two or three years after the war as high as $5,000,000,000 a year. Then, as Russian industry is restored, imports from the United States might taper off perhaps to $2,000,000,000 a year.

Actually, these estimates are far too optimistic, unless the United States is prepared (1) to help Russia pay by buying vast quantities of Soviet raw materials, and (2) to provide large credits to handle the purchases during the first few years of rehabilitation.

The relations of American exporters with Russia during the period covered by the three Five-Year Plans have been eminently satisfactory. Moscow has met all of its obligations punctually; fifteen years of experience have reduced contract forms to the point where they cause a minimum of misunderstanding between the Russian representatives and the American producers; individual American companies with extensive prewar experience in handling Soviet business already are offering large credits on initial postwar orders though these may yet be replaced by large government credits at lower interest rates.

But the volume of trade with Russia after the war hinges upon Moscow's ability to pay. Never before the war did the United States buy more than $30,000,000 of goods a year from Russia. As late as 1938, Soviet exports to this country amounted to as little as $23,500,000, far less than enough to pay even the service charges on the credits which would have to be extended in connection with exports of several billion dollars a year. Only South Africa produces more new gold each year than the Soviet Union. But the United States does not want gold; more of it would only complicate the problem of controlling prices here.

If the United States, however, is to achieve, after the war, the high level of national income which is necessary (1) to keep our expanded factories in operation, and (2) to service the national debt, it might absorb from $90,000,000 to $100,000,000 a year of the kind of goods bought from Russia before the war—furs, timber, manganese, chromium, and handicrafts. But unless this volume of purchases from Russia can be boosted by another $50,000,000 annually, credits of the size necessary to fill immediate Russian needs could not be serviced without large supplemental importations of undesirable gold.

The nub of the situation is that Russia offers an extraordinary potential market particularly for our heavy industries which have grown so enormously during the war. But if this sales outlet is to materialize, then the United States must find a way to import from Russia (or from Russia's debtors if any) from ten to twenty times as much as we did before the war. Instead of merely going after the export business, American businessmen must explore with the Russians the possibility of buying bigger supplies of Soviet products.

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But more than the Russian market itself hinges upon sound cooperative action by the world's two leading military-industrial nations.

If trade between them is held to a minimum and if relations are strained, the flow of trade all over the world will be adversely affected.

Europe, long this country's biggest export outlet, certainly will never take the bold steps necessary to reconstitute its economy on a peacetime basis if Russia and the United States drift into a race for military supremacy.

The Balkan states, which may be industrialized by Moscow in order to reduce their dependence on Germany, and the Arab world with its huge need for transportation, irrigation, and sanitation, will not dare accept American credits or make big contracts with American engineers if Moscow frowns on the deals.

And refusal of Russia and the United States to work cooperatively to maintain the peace would kill, in their present embryonic stage, all dreams of a vast industrialization program for China.

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The opportunity to make a major change in the trade map of the world and at the same time to achieve a sharp rise in our own standard of living is before us.

It demands of American business leaders the kind of boldness and imagination that their predecessors displayed when they pioneered this country's unknown West.

It demands realistic action by men who know that the solution to this country's *real* foreign trade problem under today's conditions lies in boosting *imports* not exports alone . . . men who are not afraid of being paid for what they sell.

It calls for leaders who will approach Moscow and other major customers at once with constructive plans that would parallel in scope those on which this country is waging war . . . leaders who will make it clear at the outset that this bid for cooperative action emphatically demands that each nation shall have complete freedom to determine its internal political and economic organization without interference from the other.

It is *this* caliber of leadership upon which our future hinges.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

THIS IS THE 29TH OF A SERIES

The Economic Reconstruction of Europe

THE time is fast approaching when allied and enemy populations alike will demand a blueprint for the economic reconstruction of Europe. The peace plans following this World War will be written piecemeal, and by experts, at a series of continuing conferences, such as Hot Springs, Bretton Woods, Dumbarton Oaks and Quebec, each tracing a new pattern for negotiation and each dealing with a single, specific problem. In the drawing of these plans, the United States, as owner of more than half of the world's industrial capacity, controller of the only great credit reservoir, and possessor of the largest force of highly skilled technicians and management engineers, has heavy responsibilities which its industrial, financial, agricultural and labor leaders cannot evade.

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Just what is the problem which the world's business leaders must help solve in Europe?

The best safeguard of peace is economic opportunity—a good chance for all peoples to raise their standard of living by their own ingenuity, foresight and industry.

Frustrated and disappointed peoples, who view the future with misgiving rather than hope, breed fanatical demagogues who seek to divert nations from their ills and disappointments by promising military glory and conquests.

Consequently, an important step in building a secure and lasting peace is to open the doors of opportunity to the peoples of Europe.

The greatest obstacle to opportunity in Europe has been economic nationalism.

The economic tradition of the Continent always has been highly nationalistic. The national feeling generated by the first World War, and the political autonomy conferred upon many peoples by the peace treaties, led to a great growth of economic restrictions. This trend was accentuated by the depression and by the military plans of the Fascists and Nazis. Hitler had to show his people they could be fed even if a blockade was imposed again. The inevitable result of these influences was to carry self-sufficiency to tragic extremes.

Economic nationalism holds down the standard of living of Europe in two ways:

1. It prevents the rise in most European countries of low-cost mass production.
2. It operates against an efficient geographical division of labor, preventing nations from doing what each can do best.

Great machines require great markets. One great machine of which the United States has many and Europe few is the continuous strip steel mill. At the outbreak of the war we had twenty-eight such mills of various sizes, England but one, and Continental Europe one. A building containing one of these machines is more than a quarter of a mile long and the minimum cost of the mill is almost $25,000,000. Only the prospect of a mass market justifies production on this vast, but highly economic basis.

The wasteful geographical distribution of production is shown by the agricultural policies of Italy, France and Germany.

In the 1930's, when lard sold for less than 8¢ a lb. in the United States, it cost 32¢ a lb. in Germany. In Italy and Germany imports of wheat were banned and its production at home was heavily subsidized. By the middle of the 1930's, wheat sold for $1.55 a bushel in France, $1.97 in Czechoslovakia, $2.29 in Germany, and $2.47 in Italy. At the same time the United States and the other efficient world producers and exporters (Canada, Australia and Argentina) were *restricting* production and were unable to average more than about 75¢ a bushel for their wheat.

Economic unity in Europe must ultimately mean a freedom to trade not greatly different from what we have within the United States. Given economic unity and the large markets which go with it, efficient mass production will develop. With Europe receiving cheap supplies of such staple foods as wheat, pork, lard and dried fruits from overseas, European farmers can prosper by specializing in producing fresh foods—butter, cheese, eggs, fruits, vegetables.

Then European agriculture will be more prosperous producing its specialties, and our agriculture (and that of the other great efficient surplus-producing countries as well) will have greatly expanded markets for our staples.

With a cheaper food supply for Europe—yet one yielding a better price for our agriculture—European labor will live better. Labor now used uneconomically for agricultural production will be released for industry. With big machines and semi-automatic processes European labor can produce more steel, automobiles, furnaces, plumbing and electrical appliances to advance its standard of living in coming decades, as the United States has done in past decades.

A rising standard of living in Europe will bring

Europeans to view peace with optimism and hope. And world trade grows as confidence and prosperity widen.

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How would a Europe which possesses economic unity appear to us on this side of the Atlantic?

It would be a prosperous Europe that would have strength in its advancing industries, but as the single great agricultural deficit area of the world, it would be dependent upon overseas supplies for vital agricultural staples. This dependence upon overseas agricultural supplies would be greatest for industrial Germany. Some people believe that a strong Europe would be a threat to world peace. More important, however, is the fact that a strong and prosperous Europe would not be a frustrated Europe. It would have found a way to achieve a rising standard of living. Furthermore, a prosperous Europe would, economically, be a dependent Europe because, although the European industrial worker would use more and cheaper food, he would have it only as long as he maintained the peace.

A prosperous Europe would be of special advantage to American agriculture (if we do not keep on pricing ourselves out of the market) and of great advantage to American industry.

The British policy of buying agricultural staples from abroad, for example, made her, a nation of only 45,000,000, the purchaser, in 1937, of $250,000,000 of all kinds of agricultural products from the United States. In the same year the rest of Europe (exclusive of Russia), with a population of 325,000,000 purchased only $300,000,000 of our agricultural products. But with more sensible organization of its agriculture, Europe could be expected to buy more than one billion dollars of agricultural products from us.

By far the greatest market for an expanded European industry will be Europe itself.

For American industry, there will be growing markets in Europe as industry expands. Experience shows that the trade between different highly industrialized areas is large. This country's biggest export markets have been with its keenest competitors—Britain, Canada, Japan, France and Germany.

Before the war, Europe, with two and one-half times the population of the United States, had only one-sixth as many automobiles.

If Europe (exclusive of Britain and Russia) were to motorize proportionately, it would need 75,000,000 automobiles. With normal depreciation this would ultimately mean 10,000,000 cars to be produced annually to replace worn out cars.

If one still wonders about the immense number of things Europe might produce *for herself*, let him calculate the highway expenditures, the filling and repair station businesses that must be equipped and maintained; and the doubling of the steel production that would be required to make the automobiles themselves and to reinforce with steel even a moderate amount of additional concrete highways.

Another example is the electrification of Europe. With two and one-half times our population Europe's consumption of electrical energy would be 175 million electrical H.P., if the European worker were to have the advantage of as many H.P. as the American. Yet, just prior to the war, Europe's installed operating capacity was only about 40 per cent of this figure.

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What has been sketched for Europe is actually much more nearly a page from the economic history of the United States than it is mere prophecy about a desirable future for a Europe at peace. But how can it be achieved? And what is our part to be in helping to bring it about?

Economic unity can be provided for the sovereign states of Western Europe by the peace treaty or treaties adopted at the end of the war. The provisions for securing *economic unity* in Europe should specifically cover:

1. Substantial freedom for persons and enterprises to do business anywhere in Europe.
2. Reasonably free movement throughout Europe of persons for employment, recreation and education.
3. Greatly increased freedom of trade:
   a. Within Europe—through the application of a Europe-wide agreement reducing the tariffs among all European countries to a maximum of 10 or 15 per cent.
   b. With the rest of the world—through reduction of European tariffs on goods bought from overseas. This would call for generally lower levels on manufactured goods, and for the removal (after a reasonable period of progressive reduction) of tariffs on all agricultural foodstuffs and most industrial raw materials.
4. A special currency provision requiring as nearly as practicable complete currency stabilization for all countries of Western Europe among each other.
5. Creation of an agency (with adequate revenues) through which all Europe-wide business and other affairs affected by these agreements would be administered for a minimum period of twenty-five years.

This would permit the economic unity of Europe to be substantially achieved. During this period, assistance in administering the provisions would be given by officials of the United Nations.

Near the end of such a period arrangements could be made for a vote in the European countries on whether or not to continue the "unification provisions." If the vote were in the negative, the United Nations would have proper warning that additional safeguards would be necessary to prevent war.

The suggestions made in this statement aim at securing economic unification of Europe and thereby promoting the possibilities of permanent peace in Europe.

The realization of these possibilities throughout the postwar years requires a freely expressed public opinion in Europe to guide all who share the responsibility for bringing peace to Europe and to the world.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

THE NATIONAL DEBT—

and Your Postwar Job

Coming upon the heels of a ruinous ten-year depression, this war has once more made it clear to us that the strength of our country depends upon our ability and willingness to produce. Until the world conflict eclipsed the depression, we saw what failure to use our productive capacity can do — even to a country potentially as rich as ours.

The stark reality of war finally shocked us out of our economic lethargy. The necessity of supplying our Armed Forces with almost unlimited quantities of goods unleashed our inventive genius and revealed to us our real capacity to produce. It indicated what our standard of living might be if, in time of peace, we used our full productive capacity.

Today we are producing more than all the other nations combined, half again as much as in 1940. Today our production is insuring victory to our fighting men.

But what of the future?

Already our national debt has reached astronomical proportions, and it is going higher. The depression years' fear of insecurity that all but paralyzed our spirit of enterprise, our inventive genius, and our natural instinct for expansion, appears likely to return promptly if industrial activity again is curtailed for long because of unwise public policies.

This war is being fought to make men free. But our economy cannot be kept free through military conquest alone. There is another responsibility which we on the home front cannot avoid any more than we can build walls around our future. That is the problem created by our frightening public debt.

This is a two hundred billion dollar war. It affects the lives of every one of us. At the end of this war, the public debt of the United States will be at least ten times the twenty-five billion dollars that it was at the end of the first World War. It will be almost twice the present annual national income of the country. The interest charge alone will be about 4 per cent of the national income. If the burden were spread evenly, interest alone would take at least $80.00 of every worker's income per year, or approximately $1.60 out of each and every weekly pay check.

Some people fear that the heavy taxes required by the debt will keep the country poor by obstructing employment and limiting the output of goods.

Others believe that the size of the debt does not matter because we owe it to ourselves. They reason that if A is taxed $100 to pay $100 interest to B, A has $100 less to spend and B has $100 more, but both together have the same amount. They, therefore, hold that the demand for goods and the volume of employment remain unchanged.

Which view is correct?

Is our huge debt bound to be a crushing burden which limits employment and lowers the nation's standard of living, or will it simply redistribute income? May the public debt under certain conditions even be used to help increase employment and raise our living standards?

Most people, rich and poor alike, find it difficult to believe that the national debt "just doesn't matter". They know that the interest alone on this huge debt will be almost equal to the total amount of taxes ever raised before by the government for all purposes in any peacetime year. They find it difficult to follow the kind of reasoning that suggests increasing the already mammoth debt year by year in order to maintain full production and employment. They fail to see how this "debt raising" can go on indefinitely.

On the other hand, the records show that other nations have more than once successfully managed even greater debt burdens than will confront the United States after the present war. The interest on the British debt after the Napoleonic Wars was nearly 8 per cent of the national income, and after the first World War was over 7 per cent. But despite heavy taxes and some unfortunate mistakes in economic policy (such as restoring the prewar pound), per capita real income in Great Britain rose about 31 per cent between 1920 and 1929. In fact, it rose as rapidly as it did in the United States. The world depression was far less severe in Britain than it was in the United States; and, by 1936, when industrial production still was 6 per cent below 1929 in the United States, it was nearly 16 per cent above 1929 in Britain. Britain's heavy debt burden proved less of a handicap to her during the depression than our weak banking system did to us.

Whether the debt becomes a crushing burden or whether we use it to further our progress depends upon who holds the debt and how the money is raised to pay the interest.

Here are the important possibilities:

1. If the expenses of the government, including the interest on the debt, are met largely by heavy taxes upon business profits—i.e., by taxes upon job-giving—then they will reduce employment, output, and our standard of living, regardless of who holds the debt. Heavy taxes on profits prevent enterprise from expanding current operations or enlarging the capacity of its plants, unless the prospects for profit seem certain and the prospects for loss are slim. Hence the jobs that might be created to take advantage of long chances will not come into existence, and the country as a whole will be poorer.
2. If the expenses of the government are met largely by stiff surtaxes upon the incomes of persons who do a considerable amount of saving, and the debt is, in the main, owned by millions of small investors, then the net effect of the debt upon the volume of employment and output will be fairly neutral. The stiff surtaxes, while reducing the savings of the well-to-do, will cause them to avoid risky investments and to hold part of the savings of each year in the form of cash. This will limit the demand for goods and the volume of employment. But this effect will be partially offset if millions of small holders of the debt are led by their savings in government bonds to spend a larger part of their current income.
3. If the expenses of the government are met largely by sales taxes or other taxes on small incomes, and if the debt is held largely by the well-to-do or by business corporations, then the effect of the debt will be unfavorable to employment and production. The limitation to the spending power of the small-income group will reduce the volume of investment opportunities, and the transfer of income to the well-to-do will increase the volume of investment-seeking funds.
4. If the debt is widely distributed among millions of small holders, and the expenses of the government are met largely by taxes on individuals, if substantial exemptions from surtaxes are given for all income invested in new plant or equipment, and if there are liberal offsets for losses, then the debt will help increase employment and raise the standard of living. The millions of small holders will gain a sense of security from their accumulated savings and hence be encouraged to spend a larger portion of their current incomes. The stiff surtaxes will reduce the savings of the well-to-do; liberal exemptions for income put into new plant and equipment, and generous treatment of losses, will cause the well-to-do to invest their savings in job-giving enterprise rather than to hold them in idle cash.

But what is the situation today?

Today, non-banking corporations own nearly half of the Federal debt, commercial banks about one-fourth, and individuals less than one-fourth. Not more, and probably less, than one-tenth of the debt is held by persons earning less than $5,000—although these persons receive three-fourths of all income.

Today, about half of the revenues of the Federal government come largely from taxes which must be regarded as ***taxes upon the creation of new jobs.*** If these conditions continue, we may be sure that the debt will be a disastrous obstacle to a rising standard of living after the war.

What can be done to change this situation?

To begin with, vigorous steps should be taken to get much more of the debt into the hands of individuals, particularly of those in the small-income group. During the last three years, the incomes of individuals, after taxes, have exceeded the supply of consumer goods by $74.2 billion. In other words, individuals have been compelled, by the sheer scarcity of goods, to save over $74 billion. Of this amount, only $27.4 billion, or 37 cents out of every dollar, has gone into government bonds. Indeed, individuals have saved more in the form of cash and bank deposits than in the form of government bonds. The sale of war bonds to individuals was most disappointing in the recent drive. It was so disappointing, in fact, that I would favor a special drive ***for individuals only,*** to be scheduled before the next general drive. During 1944, when the supplies of civilian goods are severely restricted and when the fighting is at its climax, the Treasury will have its best opportunity to persuade individuals to buy more bonds. This opportunity should not be lost. An increase of at least twenty-five billion should be the goal for the next year. Every citizen should be made to understand that by buying war bonds now, he is not only helping to win the war; he is helping to make possible a more prosperous and stable America after the war.

The efforts to sell bonds to individuals should be vigorously continued throughout the shift from war production to civilian production. During this period, corporations which, up to now, have been the largest buyers of government bonds, will need all their depreciation allowances and undistributed profits to pay for new equipment, and to restore their own dealers' inventories. The government, however, will still have large bills to settle and will need to sell as many bonds as it can for some months after the end of hostilities. During this period, the demand for most types of goods is likely to exceed the immediate productive capacity of industry. Hence, the sale of bonds by the government will make for economic stability.

The huge expenses, including interest on the debt, which the government must meet after the war, require that the tax system be drastically reformed. Today, taxes fall most heavily upon those incomes which are the reward for increasing production and employment, because profits are taxed first as corporate profits, and taxed again as dividends to owners of the corporation. Surtaxes are so stiff and offsets for losses so meager that the well-to-do capitalists cannot afford to encourage and help promising young businessmen to start new enterprises.

A nation whose expenses are as large as those of the United States will be after the war must be sure that its tax system provides incentives, not penalties, for increasing production and employment.

Should the debt be repaid? Some people fear that any reduction of the debt would have a deflationary effect and cause unemployment. An opposite view was expressed by Mr. Morgenthau recently: "We have a big public debt that must be paid off, and the quicker we do that the better." Both of these views are extreme. Repayment of part of the debt during a period of depression would increase unemployment. Every period of high prosperity, however, would give the government an opportunity to pay off part of the debt without limiting employment. During these periods of prosperity, business corporations will sell government bonds in order to buy equipment; and many individuals will redeem war savings bonds in order to purchase houses, automobiles, and other goods. If the government budget runs a surplus during periods of high prosperity, and if this surplus is used to retire some of the bonds sold by corporations or redeemed by individuals, the country will be protected against a disorderly and speculative rise in prices. Thus, reduction of the debt can be made a device for stabilizing our economy.

There are two other reasons why reduction of the debt will be desirable.

In the first place, it will help prepare the country financially for a possible third World War. Determined as we are that this war shall be the last one, common sense tells us not to count on this. At any rate, we must be prepared for any eventuality.

In the second place, gradual reduction of the debt would stimulate employment by creating the expectation of lower taxes. It is not generally appreciated how much the willingness of individuals and business concerns to spend money is affected by the prospects of higher or lower taxes. One of the best ways to make individuals and enterprises spend more freely is to convince them that taxes will become a little lower, year by year.

Many people have difficulty in visualizing the day when there will be a substantial reduction in the burden of the national debt. And yet, if the country pursues wise economic policies, there is no reason why the debt burden should not be cut in half during the next generation.

The days of technological progress and economic expansion are not over. They are, in fact, only well begun. During the Twenties, the national income in dollars of constant purchasing power increased by well over 50 per cent. Between 1929 and 1939, it increased by less than 6 per cent. Perhaps the rate of the Twenties cannot be maintained indefinitely; but scientific research and development work in industry are laying the foundation for very large advances in national income. Suppose that the national income increases 33 per cent in the first decade after fighting stops (say, hopefully, 1945), 25 per cent in the next decade, and thereafter at the rate of 20 per cent a decade. In 1955, the national income (at present prices) would be about $173 billion; in 1965, about $216 billion; and in 1975, about $257 billion. By 1970, the burden of the debt would be reduced by nearly half, even if not a cent of it were repaid!

A huge public debt is a test of the character, the common sense, the foresight, and the equally important technical and engineering skill of a nation. *It requires that tens of millions of small income earners be willing to become substantial holders of the debt. It requires that the nation be willing to tax itself heavily, but in ways which increase the attractiveness of job giving or self-employment relative to job-holding; it requires that the nation be willing to pursue policies of expansion and to put a rising income for the nation ahead of the pleas of self-seeking groups in labor, agriculture, and industry.*

A huge debt may so draw out the hidden powers of a people that it makes the nation wealthier rather than poorer, stronger rather than weaker.

Up to now, Americans have not met the test of a big public debt too well. Individuals have saved more in cash than in government bonds, and the country has shown little interest in avoiding the kind of taxes that reduce the demand for labor. These shortcomings, I am sure, stem largely from the fact that the American people never have had the problems of debt and taxation honestly and adequately explained to them.

I have confidence in the American people. I believe that Americans have the intelligence to understand this problem of the public debt, the character to face their responsibility regarding it, and the common sense to accept the challenge and make the most of it.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

FREE ENTERPRISE

The Obligation of Management and Labor to Cooperate... in War... in Peace

The Invasion is on! We have unleashed our full might or military victory. We have confidence that our great rength will bring success. We are strong because we ave achieved unity in mobilization and in combat.

Though victory appears assured, we cannot rest until e have done everything in our power to speed the day hen death and destruction are halted.

The home front is an important factor in this time ement, for the fighting power of our Armed Forces epends upon their weapons. Napoleon's army fought on its stomach"—man against man. Eisenhower's men ght on their tonnage—tanks, artillery, machine guns, avy bombers.

As never before in the long succession of wars, the gends of heroic deeds on the battlefronts in this world nflict will be paralleled in history by the great accomlishments on the production fronts. Along with these eroic achievements of our Armed Forces, the world will ng remember the record of our production accomplishents which have made us the stongest military power the world, as well as the arsenal of democracy.

As the conflict reaches its climax, as battles grow ercer and more destructive, our responsibility becomes reater and more critical. We must coordinate our proctive efforts with the same ingenuity and the same recision with which our Armed Forces have coordiated theirs. We dare not waste the productivity of a ngle man or machine in these critical days.

As our landing craft are discharging our fighting men n the beaches of Europe and the Pacific, they must not ant for equipment. No interference with war productn for any reason can be justified. There must be no icket lines in America!

The landing of American troops in France virtually as stopped all strikes in the United States. This is imortant and encouraging news because the prelude to nvasion, unfortunately, has been an epidemic of strikes. ime lost through strikes, during the first four months f 1944, was double that lost during the same period st year. April saw more strikes than any other month nce Pearl Harbor, and in May the record again was roken. Here is what happened within two weeks in May:

> Nine thousand men in six Chrysler plants in Detroit were out when a jurisdictional dispute in a "soda pop" war between the American Federation of Labor teamsters and the Congress of Industrial Organizations fired their discontent.
>
> A three-day sit-down strike occurred among 950 employees in the B. H. Aircraft plant over the refusal of the company to discharge a superintendent unsatisfactory to the union.
>
> Thirteen hundred men in the Chevrolet transmission and axle plant at Saginaw struck over a no-smoking rule and a change in shift-starting time.
>
> Two thousand employees at the Browne and Sharpe Manufacturing Company walked out when a woman was hired to fill a job long held by a man.
>
> Production of penicillin, blood plasma, and other medical supplies was halted at two Detroit plants of the Parke Davis Company as 1900 employees struck for a ten-cent raise.
>
> Over 25,000 lumber workers in the Pacific Northwest struck because the War Labor Board denied their demand for a wage increase.

At the end of the third week of May, 70,000 workers in 26 plants in Detroit were idle because of strikes.

Strikes in Detroit alone reduced production as much as a moderately successful German air raid would have done. Far more important than their effect on output is the effect of strikes upon national unity and morale. To our home front and to our Armed Forces, strikes belie our pledge to back the attack with all the power at our command. Hence, strikes limit our all-out war effort.

Prompt and decisive action is needed to keep America free from strikes for the remainder of the war. Stoppages of work on the production lines cannot be condoned while lives are being lost in fighting the enemy.

Most union leaders realize this need and are preparing to impose discipline upon their members who violate the no-strike pledge. The Warehouse Division of the International Longshoremen's and Warehousemen's Union (C.I.O.) recently declared: "Strikes in this time of war are treason against the nation and betrayal of the interests of labor." A message sent by William Green to all heads of American Federation of Labor unions stated:

> "D-day is here. From now on until Hitler is finally crushed, every worker enrolled in the army of production must consider himself a part of the invasion forces of the United States and conduct himself accordingly. I call on you in the name of the American boys who are risking their lives under enemy fire to maintain uninterrupted production under any and all circumstances. Until victory is won every worker must give the same all-out service that our Armed Forces are giving on the field of battle."

Strongest of all was the appeal of R. J. Thomas, president of the United Automobile Workers, to members of his union:

> "Our union cannot survive if the nation and our soldiers believe that we are obstructing the war effort . . . there can be no such thing as legitimate picket lines . . . I appeal to our membership. If you value your union, if you want to live and serve after the war, we must restrain ourselves and our hot-headed brothers today. If we do not, there will be no union after the war."

Union officers are entitled to vigorous support from management and government in their efforts to prevent strikes. Behind many a strike is an accumulation of unsettled grievances. Managements are overworked, and many union shop stewards are new and inexperienced and do not always do their part in turning down cases which lack merit. Both of these conditions make it easy for large backlogs of unsettled grievances to pile up. A special drive to clean up unsettled cases and to prevent new accumulations of them is one way by which managements and local union officials can help shorten the war.

The government too has a contribution to make to the prevention of strikes—both through the prompt disposal of disputes and through firm action against the leaders of strikes. The National War Labor Board and the Regional Boards are disposing of over five thousand cases a month and have made an excellent record in reducing their backlogs. Nevertheless, the boards still have many old cases; and about one out of four strikes has been an effort to get action from one of the labor boards. The boards are entitled to cooperation from employers and unions in keeping down their docket. In instance after instance, cases are dumped in the lap of the board before the union and employer have made a real effort to get a meeting of minds and to work out settlements.

In the present emergency, strikes are an expression of the lack of adequate understanding and team work between unions and management. Any future great upsurge in industrial strife likewise will be due to misunderstanding. After this war this country must not go through another "1919" when the time lost from strikes reached an all-time high. With 13 million workers, or almost half of the non-salaried employees of the country, in trade unions, the power and prestige of unions is greater than ever. ***The long-run prosperity of the country requires that business and labor learn how to cooperate in supporting the policies which produce the largest possible profits and the largest possible payrolls.***

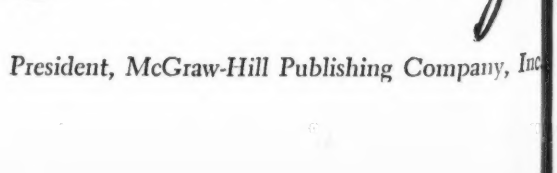
Although business is primarily interested in the largest possible profits, and labor is primarily interested in the largest possible payrolls, both objectives call for the same basic conditions. Payrolls depend upon the prospects for profits. If bad relations between business and labor or unwise public policies cause employers to take a pessimistic view of the outlook for profits, both employment and payrolls will be depressed.

Individual unions and individual employers always will have differences over wages and hours and the status of labor in particular plants or in particular occupations. Some disputes on such issues are inevitable, but resort to arbitration and calm intelligence can help greatly in avoiding strikes in the long run. Cooperation between labor and management is an economic necessity. In our kind of economy, payrolls and profits ***both depend upon the willingness and the ability of business and labor to work together in creating the conditions under which enterprise flourishes.***

The foundation for intelligent and effective cooperation must be accomplished by skillful and imaginative managers in plants throughout the country who are willing to help unions with their problems, and who are able to interest union leaders and their members in the problems of business. Union members and their leaders are keenly interested as a rule in the efforts of management to win new markets. They know that jobs depend upon the success of managements in improving the product, adding new items to the line, and, less frequently, cutting costs and prices. Employees like to be kept informed about what management is doing, what problems it is meeting, and what success it is having. Most of all, they like to have an opportunity to contribute their ideas and suggestions.

The recent epidemic of strikes should not blind us to the fact that even today there are more plants where managements and unions are on good terms than ever before in the country's history. Consider, on the one hand, the extensive and constantly growing efforts of unions to train and develop shop stewards and, on the other hand, the efforts of employers to teach foremen how to carry out the new responsibilities imposed upon them by union agreements. Unions and managements together are learning how to operate together such technical devices as time study and job evaluation. Managements which, several years ago, opposed the provision of umpires to interpret union agreements and to settle deadlocked cases today are taking the lead in suggesting such arrangements.

The war is reaching a crisis, and all groups in the country must be aware as never before of their common interests. This presents an opportunity which should be seized to lay the permanent foundations for more effective team work in American industry. Let history record that the days when Europe was being liberated also were the days when unions and employers were making unprecedented progress in preparing American industry for the return of the service men by developing policies of cooperation between business and unions. Such cooperation will help achieve a peace worthy of our efforts and our sacrifices.



President, McGraw-Hill Publishing Company, Inc.

THE COST OF
Tomorrow's Peace

Today peace-loving Americans are united with thirty-three other nations in a common objective of destruction.

Millions of our fine, young men and women find themselves invading foreign lands in order that their own shores may be spared, and their free way of life preserved.

Their sacrifices will be great. Their job will be well done.

But what of the job they will expect of us when they have finished theirs . . . the job of turning their hard-won victory into a lasting pattern of peace?

Can we come up to their great expectation? We must realize that this is the last opportunity of our generation. We must do a better job of it than we did in the Twenties and the Thirties.

We have our backs to the wall, and the scars of World War I and a thirteen-year depression still are upon us. The final test of our way of life is at hand!

As we look over our shoulder into the immediate past, we see little to encourage us. But we also see much to make us pause. We see a tremendous fighting machine, created in a matter of months by the miraculous organization of our resources.

We, the largest of the peace-loving nations, have overnight become masters at the business of waging war. Today, as a result of the coordination of industry, labor, and government, we are producing ***for war alone*** as much as our total normal production for peace.

* * *

We have amply demonstrated our ability to harness the vast productive capacity we possess. Why cannot these resources, which we have organized so efficiently for the destruction of life and property, be directed toward the destruction of the causes of war?

May not the patriotic and emotional strength and the unity of action which have been stimulated for the purpose of winning the war be directed, at least equally well, toward the attainment of world peace and international harmony?

If they are not so directed, what lies ahead but another war? And how can America, in a world that is so rapidly shrinking in size, avoid involvement in ***any*** of tomorrow's conflicts?

International peace is an ambitious dream and its price is high, but the price of war is even higher. Our world cannot long survive the periodic waste of its human and material resources.

Our country can be the most potent single force in bringing about the international understanding that leads to peace, in developing the unity that will make the most of the ample resources nature has provided everywhere.

* * *

There is no unity in selfishness. There can be no unity if any one of the great powers fails to do its part in determining and eliminating from the world the basic causes of aggression.

These basic causes stem from greed and the suppression of opportunity for individual progress; for self-preservation is the first law of nature.

Mussolini's dramatic march on Rome in 1922 was made possible by disillusioned veterans of World War I who could find no jobs and whose future held no promise. Some of Hitler's most

determined followers came from the same ranks.

Men denied the opportunity to make a living, for themselves and for their children, are easy prey to false doctrines and dangerous "isms."

In any realistic appraisal of our domestic problems—economic, labor, racial—it is clear that we can solve them, not by waiting until we reach some utopian accord, but by making a series of compromises. We do this because we know how discord can impair the very roots of private enterprise, self-government, and self-discipline—the essentials of a dynamic democracy.

Similarly, peaceful reconstruction of our world economy depends on the ability of nations to reconcile their differences in a series of working agreements.

If we in the United States want lasting peace and if we want to preserve our democratic way of life, we must take over our full share of the task of initiating these compromise measures. Acknowledging our inescapable responsibility as the greatest economic and military power in the world, we must attempt to insure the free flow of world trade, and develop—with profit for both parties—backward areas abroad as well as at home. And we must do this by making all nations share the responsibility, not by allowing ourselves to be manoeuvered into being an international Santa Claus.

With our allies, we will have to see to it that the devastated portions of the world rehabilitate themselves as quickly as possible; that practicable and realistic trade and economic relations between nations are developed; and that the energies and productive capacities of these nations are set free to function in a climate that is favorable to the growth of free enterprise and individual initiative. As the most powerful economic force on earth, we have the most to gain and the most to lose at the peace table; and we must never forget that with our power comes responsibility.

We cannot hope to solve all of the problems of all nations—nor even all of our own—but our way can become the way for more of the world's humanity. Our strength can become the guiding spirit of the smaller nations.

* * *

In the development of a sound American foreign policy, let us take care not to attempt to control the destinies of other nations. Let us remember that we must set the example of self-determination of independent, free peoples.

Freedom is essential to international peace; and free competition—whether it be between individuals, between businesses, or between nations—is the mainspring, the synchronizer, and the preserver of freedom. For competition always is synonymous with private enterprise.

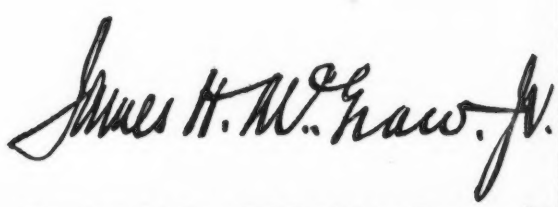
We are not a covetous nation. We have no territorial ambitions. Our international commercial aspirations are dominated by the conviction that we have a great stake in world unity and world prosperity. We know that we can no longer live apart from other nations and that we cannot ignore the fundamental elements which affect the well-being of other countries.

Our foreign policy must encompass a world of trade, and help develop it.

We dare not blunder in the execution of that foreign policy if the American way of life is to survive. A democracy resolved upon isolation is doomed in the world of tomorrow.

Let us resolve that out of this devastating catastrophe we shall emerge with fuller understanding and greater determination to build the kind of world which can materialize only if this country has the vision and the will to see it through.

We still are free to decide our own fate—still free to shape our own future. We still are free to preserve the liberty and happiness that has made our country the hope of the world.



President, McGraw-Hill Publishing Company, Inc.

INVASION *and the* FINAL CHALLENGE

The idea that our national security some day would depend upon the successful invasion of continental Europe by our armed forces was inconceivable to the average American but a few short years ago. Yet, today our whole strength is assembled to that very action and for assuring a sound and permanent peace.

America became great without aggression . . . without tyranny. Our greatness has been achieved without destroying others . . . ours is a history of unprecedented industrial progress, of development of our own resources and reliance on our own efforts.

Aggression is foreign to American philosophy. Yet, today we find ourselves faced with the choice of destroying or being destroyed. Today we are confronted by the hard fact that the kind of peace which we all so fervently desire can be achieved only by crushing autocracy and by removing the causes of aggression.

We are now engaged in the accomplishment of the first objective. Since Pearl Harbor a complacent, peace-loving America—the largest of the "soft" and "decadent" democracies—has grown strong and tough. Out of the inherent virility of a free people we have moulded the mightiest force for invasion and attack that the world has ever seen.

We have reached our peak rates of war production. We are producing as much war equipment as all the rest of the world combined.

History will record our industrial mobilization as a phenomenal achievement.

The battle of production has been won!

The full might of our armed forces and those of our allies unleashed against the Axis war machine will bring eventual victory. Two and a half years of intensive preparation, backed by 168 years of growth as a free nation, has given us superiority over twenty years of painstaking preparation by the totalitarian and militaristic countries with their enslaved peoples.

Every American has contributed toward this powerful offensive. Our manufacturers and business leaders have exerted their fullest efforts. Our industries have mobilized their tremendous resources—tapped to the fullest degree their inventive and productive genius. The men and women in the factories, on the farms, and in the mills and mines have played a magnificent

part in the tremendous production program. Citizens all are making their contribution to the armed victory that lies ahead

We have demonstrated that a free people under a free enterprise economy can unite in a common purpose.

* * *

When the war is won, we shall be faced by our second objective . . . removing the causes of aggression. This is a social challenge. A challenge to those who would sacrifice our democratic way of life for personal gains or foreign ideologies.

The best insurance for the continuance of our democracy is a successful democracy. That means a dynamic and not a static democracy. All of us who want to preserve the ideals that have made America . . . and that includes all but a handful of extremists . . . must determine to find the policies and programs which will permit us to make the most of the abundance nature has provided for us.

To achieve this end we must recognize the fact that we are but a wheel in the machinery of world economy. A wheel that must drive or be driven. A wheel that must mesh smoothly with the many other wheels or be stripped of its cogs.

We are the only nation on earth free enough and strong enough to shape the mould of its own destiny. We can be hampered by nothing but our own confusion.

* * *

The mind and the heart of all America today brood over the shores of Britain and watch over the narrow waters that wash the beaches of the Continent. And the prayers of all America go with each of those who embark upon that epic passage.

Those of us at home who are producing the fighting tools and who are so earnestly concerned with the problems that will face a postwar America, should see now, even if we may never have seen it before, that all our plans will be worth just exactly what the men and women who make that passage are prepared, competent, and inspired by their leadership to make them worth.

For those men and women are America!

They have gone out from rich homes and poor homes alike, from farms and factories, from schools and churches, from mines and ranches, from offices and studios, to take their places in the battle line. They are a cross-section of the America that is to be.

Whoever may draw the plans for that America, it is those men and women who will make the plans good. Invasion is their first step toward that end. May their work be speedily done, and may our plans be worthy of that work.

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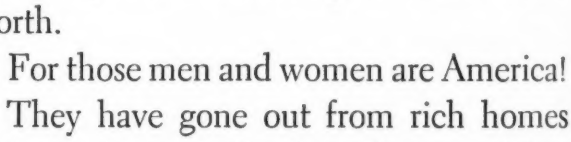

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Disposal of Government War *Plants and* Equipment

In the last four years, the Federal Government has spent over fifteen billion dollars on war plants—two-and-one-half times as much as was spent by private investors.

Of this fifteen-billion-dollar government investment, about one-third has gone into facilities for the manufacture of aircraft and for ship construction and repair; another third has gone into plants for production of combat ordnance; and the remaining third has gone into a variety of facilities for making synthetic rubber, metal products, machinery, and miscellaneous equipment.

Most of these plants are in industries that are expanded far beyond peacetime requirements. Furthermore, their convertibility to other civilian uses will, in many cases, be complicated by their specialized equipment and layout, by their tremendous size, and by their uneconomic location. At the moment, it looks as if roughly one-third of the government-owned plants and equipment can be converted fairly readily to peacetime operation, and will, therefore, be easily disposable to private enterprise.

The discovery of unsuspected uses for war plants and equipment may well raise the disposable proportion to one-half or more. The government, at the end of the war, may own about one-eighth of the commercially-usable industrial capacity of the country. It will be by far the largest owner of machine tools; it will own enormous aluminum capacity, magnesium capacity, many miles of pipe lines, and more ships than the entire private shipping industry.

What the government does with its war plants will have a profound effect on the free enterprise system and on all workers, employers, investors, and consumers who have a part in that system. If this problem is handled badly, we may find ourselves enmeshed in a trend toward monopoly and government operation of industry. If the problem is handled well, we shall have taken a big step toward freedom of action in a competitive society, toward full opportunities for business enterprise, toward well-paid productive jobs for workers, and toward a higher standard of living for us all.

Recently, three important events have signalled encouragement. They are the report of Senator George's Committee, the Baruch report, and the report of Senator Truman's Committee. These reports are noteworthy for their competent sizing up of a complex problem, for their recognition of the major responsibility of government in making a successful transition to peace, for their insistence on wise policy and good administration, and for their genuine concern that our productive powers be given full opportunity in a free private enterprise system. These reports agree on basic principles and many specific lines of action. There are, however, important areas of policy formation, organization, and procedure—especially in regard to plant disposal—which remain to be blue-printed.

In formulating the policies and practices to be followed in dealing with government war plants, our major goal must, of course, be a high level of production and employment in private business after the war.

Government operation in competition with private employers and privately-employed workers will not be desirable because it will make investment unattractive to private capital and will limit opportunities for private employment. On the other hand, sales to private buyers which result in increasing the concentration of industry will also be undesirable. We must use this opportunity to strengthen the competitive enterprise system and to move away from, not toward, the concentration of economic power in either public or private agencies.

To accomplish these objectives, a program of action such as follows will be necessary:

1. An adequate reconversion organization will be needed in the government, but its powers and responsibilities should carefully be defined by Congress. Fortunately, an able Administrator of Surplus War Property already has been appointed. It will be essential for him to work in closest cooperation with Congress and with the Armed Forces and other executive agencies. The Office of War Mobilization, and ultimately the President, must be responsible for seeing that the Surplus War Property Administration is not sidetracked by the operating agencies and is not dominated by their sheer size. Funds must be supplied generously to the Surplus War Property Administrator, so that he can set up an organization adequate to cope with this huge and complex job. Business, too, must be generous in loaning top-flight executives for postwar government service.

2. One of the first acts of the Surplus War Property Administration will have to be to assemble a complete inventory of government war plants and equipment, to make possible the planning and control of the disposal process, and to form the basis of catalogues of property available for sale.

3. Cooperation between the executive and legislative branches of the government will be needed to develop at least tentative plans with respect to matters of public policy which are of special importance to a successful transition to peace. Among these matters are the size of the military establishment to be maintained in time of peace, the stand-by facilities and reserves of materiél necessary for our security in case of future war, and our policy regarding import and production of synthetic rubber and other critical and strategic materials.

4. The Surplus War Property Administrator should

obtain from the Armed Forces, acting under congressional directives, specification of those plants which are needed to supply our peacetime Army and Navy and to provide the essential reserve capacity in case of war.

5. The Surplus War Property Administrator should select certain war plants as depots in which to store the huge surpluses of inventories and equipment which will have to be removed from private and government-owned factories in order to make possible their conversion to civilian use.

6. Those plants which are not desired by the Army or the Navy, which are not needed for storage, and which clearly will be unsuitable for peacetime utilization should be scheduled for dismantling and disposal piecemeal.

7. The two or three billion dollars' worth of government facilities intermingled with private plant should receive attention with a view to early sale, temporary continuance or use under lease, or early removal.

8. The various plants and pieces of equipment available for sale to private business should be classified conveniently, catalogued, and advertised to prospective buyers or lessors. Before the Surplus War Property Administrator offers, for private sale, plants and equipment not desired by the Army or the Navy, he should ascertain whether the plants or equipment are desired by other branches of the government or by public corporations such as the T.V.A.

9. Whenever property can be sold at prices approximating depreciated reproduction cost, that will be by far the best solution. Generous time-payment terms should be offered. In many cases the government may be unable to sell the property for reproduction cost less depreciation, for the simple reason that no one would think of reproducing it. The property may already be partly obsolete or, because of its size, location, or other characteristics, may only be moderately well suited for commercial use. This should not prevent the government from selling it, provided a price which fairly represents the worth of the property can be obtained. The best test of that worth is the price produced by active bidding under favorable market conditions.

10. When property cannot be sold at a fair price, temporary leases with options to buy should be employed to get the facilities into productive use. This should not, however, be done on terms which would cause unfair competition or create clearly excessive capacity in an industry. And the lease must be temporary; it must not be the means to prolong government control or ownership.

11. The government should offer the strongest possible resistance to local groups or industry groups seeking subsidies for continued operation of war properties. Subsidies will burden the Treasury and lead to inefficient use of resources. They will be justified only to maintain facilities needed for national security.

12. The plants and equipment offered for sale and lease should include sufficient quantities in small enough lots to satisfy the demands from small business. The war has tended to concentrate production in larger plants. After the war, we should seek a wider distribution of the government war facilities.

13. Insofar as possible, war buildings and equipment should be offered for sale in units which can be purchased by businesses in peacetime industries. Many of these industries have had to get along during the war without adequate replacement and expansion, and will be ready to buy if they are able to get what they want from the government. This is a particularly desirable market for surplus government property since these industries are, for the most part, not faced with the problems of excess capacity.

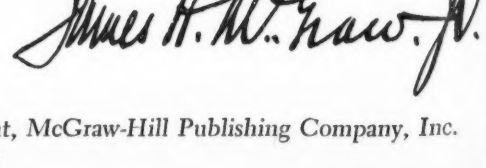
14. Property, such as machinery and other movable equipment, which is in excess of our domestic requirements or is more urgently needed by other countries, should be exported. We shall need, and can take, large supplies of raw materials in return.

15. Property which is not needed by the Armed Forces, which cannot be sold or leased on terms which would be fair to competing plants, which cannot be dismantled and distributed piecemeal, and which cannot be sold abroad, should be scrapped as soon as its non-disposability is apparent. The disposal of war plants should be completed within three to five years.

16. All negotiations for sale or disposal should be matters of open public record. As Mr. Baruch has said, the process must be conducted in a goldfish bowl. This is as much for the protection of business as for the protection of the government.

These courses of action do not include everything that must be done, but they do indicate the general lines along which our surplus war plant disposal must proceed if it is to avoid precipitating needless transition unemployment.

The gravest danger of all will be red tape, intergovernmental conflict, and inadequate administration. It would be a great misfortune for the executive and legislative branches to quarrel over details of organization when they agree on the basic principles to be followed in handling the problem. Obviously, the Surplus War Property Administration must cooperate with Congress and look to it for policy guidance. Just as obviously, the disposal problem will involve great difficulties of administration which must not be complicated by congressional interference. We shall need the best we can get in careful policy making, detailed planning, good organization, and courageous action. This is a matter of vital importance to every American. The stakes are too high to tolerate poor administration or petty politics.



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Free Enterprise

. . . INCENTIVES AND TAXATION

There are three principal ways of making a living:

1. Getting on someone's payroll
2. Lending one's savings to business enterprises
3. Starting, or helping to start, a business enterprise

About three out of four of us fall in the first group—we are ***job-holders.*** Millions of us get some income, large or small, by lending our savings—directly or through such channels as insurance companies. We are suppliers of ***loan-capital.*** About one out of four of us has his own business enterprise, and several millions of us are part owners of business enterprises. Those of us who go into business for ourselves and those of us who are part owners of enterprises are ***job-givers.***

The amount of employment in a community depends, in the main, on the number of persons who attempt to make their living, or part of their living, by giving jobs to others, rather than by getting on someone's payroll. A community seriously desiring a high level of employment and a high standard of living will strive to make job-giving attractive and to encourage a large part of its population to be job-givers rather than merely job-holders.

The number of men who attempt to make their living in whole or in part by starting new businesses or by expanding old ones depends upon the outlook for profits. When the outlook for profits improves, thousands of new jobs open up and thousands of men go to work; and, as men go to work, the farmer and everybody else benefits. When the prospect for profits becomes darker, the demand for labor, capital, and raw materials drops. It may be roughly estimated that an improvement in the prospect for profits of one billion dollars raises the demand for labor by anywhere from two billion dollars to five billion dollars.

One of the principal determinants of the outlook for profits is the amount and the nature of taxes. After the war, the Federal government will need to raise each year about twenty billion dollars in taxes—three times the amount required before the war, and six times the amount re-

quired in the Twenties. In the Twenties, the tax needs of the Federal government were roughly twice as large as corporate profits in a good year. After the war, Federal revenue needs will be roughly three times corporate profits in a good year. Obviously, it will be much more difficult, after the war, for the government to meet its needs *without discouraging enterprise,* and therefore without diminishing the number of jobs, than it was before the war. Far more than ever before, it will be necessary for the government in developing a tax program to take account of the effect of taxes upon employment and the standard of living. This means that it will be important for each and every citizen to give attention to these matters—because the policies of the government reflect, in the main, the thinking of the citizens.

Some taxes seriously discourage individuals and business firms from undertaking new and enlarged operations. Other taxes have little or no adverse effect on investments. Some taxes are a burden on consumption, affecting the sales of specific commodities, depending on the nature of the taxes. It is obvious that different kinds of taxes have different economic influences. *We must understand the forces that determine the level of employment and consider the tax program in relation to other measures designed to create more jobs.*

What are the tests of a good tax system?

1. **Taxes should be designed to encourage production and enterprise and to make it attractive for a large number of people to earn all or part of their living by giving jobs to others.**

2. **Taxation must be fair in principle and administration, with no discrimination between persons in similar circumstances.**

3. **Taxes should be apparent and not concealed, and should be levied, in the main, directly upon individuals so that each of us will know how much our government is costing him. A moderate income tax at the lower income levels will bring a greater awareness of responsibility than will heavy taxes on consumption which the taxpayer does not see because they are hidden in the prices he pays.**

4. **In the aggregate, taxes should be somewhat progressive.**

5. **The tax system should be coordinated with the broader objectives of monetary and fiscal policy.**

6. **Federal, state, and local tax policies should be integrated as to principles and objectives.**

Judged by these standards, our present tax stem is extremely unsatisfactory; in fact, it is ctually damaging. It is a conglomeration of idden and direct taxes and of conflicting taxing risdictions and policies, with no comprehen- ve economic motive. It is distorted to appease ressure groups and includes uneconomic puni- ve measures. It is full of needless complexities. t is a paradise for tax lawyers and a source of nfusion and despair for the honest, enterpris- g business man. In fact, it would seem almost s if our tax laws had been written by some fifth olumnist for the purpose of making private nterprise unworkable. We in America pretend o believe in the pioneer spirit, but no one would ver suspect it by looking at our tax system. When the war is over, there must be a thorough eform of our entire tax system. Federal taxes can nd should be reduced substantially; and, in the rocess of reduction, changes can more readily e introduced. At that time, steps can be taken o achieve some degree of coordination and unity f purpose among federal, state, and local taxing gencies. Taxes play too important a role in our otal economic life to ignore the adverse conse- uences of unrelated and inconsistent policies of different taxing jurisdictions.

The following reform measures are needed in federal taxation:

1. **Repeal of the excess profits tax at the earliest possible date after inflationary dangers subside. In the case of most enterprises, the excess profits tax destroys all incentive to do a larger volume of business than in 1939; it appropriates virtually all increase in profits above the level of 1939.**

2. **Coordinate corporation and individual income taxes so as to avoid double taxation and impediments to risk-taking. Preferably, corporation income taxes should be wholly eliminated. Otherwise, the corporation tax rates should be reduced to the lowest effective rate on personal incomes. Full credit should be given to stockholders for all corporate income taxes paid.**

3. **Encourage competition and particularly the formation of new enterprises by allowing new corporations generous tax exemptions for a period of five years. Extend the same principle to unincorporated concerns.**

4. **Encourage risk-taking (and hence job-**

giving) through extending the loss carry-over to six years or more.

5. Provide for averaging incomes over a period of years in order to remove discrimination against those with irregular incomes and those who take risks of loss in business ventures.

6. Rely upon the personal income tax as the main source of revenue, with broad coverage. The reduction in total taxes after the war should favor the elimination of excise taxes before reducing income taxes.

7. Reduce the upper range of personal income tax rates to a maximum of perhaps fifty to sixty per cent so that risk-taking investments will be really attractive. Higher rates are punitive in character, yield small receipts, and throttle risk-taking.

8. Encourage risk-taking by individuals in the higher brackets by making the surtax on incomes of $20,000 a year or more half as much on income in the form of dividends as on income in the form of salaries or interest.

9. Encourage risk-taking by individuals by permitting capital losses to be charged against general income provided the reduction of tax liability in any one year is not more than fifty per cent.

10. Repeal the tax-exempt privilege for all *new* securities issued by all governmental jurisdictions.

11. Eliminate excise taxes which place a disproportionate burden on persons with lower incomes so as to encourage greater consumption and provide an expanded market for our vast industrial capacity.

12. Reform tax administration to simplify forms and procedures, to broaden the scope of enforcement, and to encourage the spirit of fairness.

With such reforms and continuing reappraisal of the tax program as it affects the economic situation, we can look toward taxation as an instrument of constructive influence in giving the fullest encouragement to free enterprise and in attaining continued prosperity.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

Reconversion *and* Contract Termination

AMERICAN industry is dedicated to an all-out effort to achieve victory, and its good faith in this direction is amply demonstrated by the results.

American industry also is dedicated to making democracy work effectively after the victory. And it is toward this objective that industry must prepare itself to guide the processes of demobilization and reconversion in order to minimize the dislocations and chaos which too easily can result from so tremendous a task.

We exercised foresight from the very beginning of the war mobilization program. Let us now exercise foresight in the approaching changeover from a wartime to a peacetime economy.

The first step in converting American industry from military to civilian production is the termination of contracts between the government procurement agencies and the producers. There are now in force war contracts amounting to tens upon tens of billions of dollars. As the demand for weapons of war decreases, the Armed Services will undertake to cancel contracts. With the emphasis shifting from weapons of one category to weapons of another category, many billion dollars worth of contracts already have been terminated. It is hoped that the experience now being gained in this work will provide the basis for effective and sound procedures when an avalanche of cancellations comes later.

Many complex problems involved in the termination of contracts will materially influence the success of the entire reconversion program. Once war demands fall off sufficiently to permit the renewal of civilian production, we will have to act with great speed if we are to avoid large-scale unemployment. Prompt financial settlements of contracts and the rapid clearance of plants are of immediate and great significance. In many cases the removal of equipment and raw materials will be more important than money payments. The allocation of raw material for civilian production will be of paramount importance.

Government agencies obviously must exercise great care in spending the people's money and in protecting the interest of the public against excessive payments. Unjust enrichment at the expense of the people will not be condoned nor will it reflect favorably upon management to present inflated claims. But long-delayed negotiations, which will retard the initiation of civilian production, likewise must be avoided.

The contracting agencies and the manufacturers both know that the greatest losses in the reconversion period will result from delays in getting peacetime production under way. The

greatest potential wastes lie in unemployment and in idle plants. The magnitude of such losses to the public can be far greater than the money spent in liberal settlements; to the manufacturer, these losses can represent vastly more than the extra funds that might result from interminable litigation. Policies must be firmly established *now* whereby the manufacturers, including subcontractors and suppliers, will receive substantial settlements immediately in order that ample funds be available for reconverting plants and accumulating necessary inventories of peacetime goods. Nor must we overlook the fact that the uncertainty of long drawn-out disputes will have a stifling effect on enterprise and that final settlements, therefore, should be made as promptly as possible.

Plants that are equipped largely with special wartime tools and machines and that are fully stocked with materials, components, and finished military products will not be able to undertake any substantial degree of conversion until this machinery and this inventory are removed. Advance arrangements are essential for the prompt clearance of great numbers of plants the country over. Adequate warehousing facilities must readily be available so that the changeover to civilian production will not be hampered.

As war demands decline, civilian output will be resumed; and while we recognize that the demands for munitions must vary as the strategy of the military leaders is changed, it is hoped that the Armed Services already have or soon will develop schedules of their continued needs under different strategic assumptions. If we know in advance the probable curtailment in war requirements we are in position to estimate the timing and the quantities of raw materials, the number of workers, and the industrial facilities which will be available for peacetime purposes. It will then be possible to integrate the lifting of restrictions on civilian production with the drop in war production.

Needless unemployment and idle plants will prevail if restrictions on the output of civilian goods are removed at a slower rate than available manpower, materials and plants permit. On the other hand, if the controls on civilian production are removed prematurely or too freely, then the production of military requirements will be hampered correspondingly. There will be great clamor and pressure for eliminating all restrictions as soon as any measurable quantity of materials and numbers of workers are freed from war work. It will react adversely on industry as well as on government if these pressures are heeded indiscriminately, thereby retarding the production of munitions for our boys who still will be fighting and dying at the front. The coordination of declining war demands with increasing civilian production probably is the most difficult and at the same time the most important task in our entire reconversion problem. Advance planning and sound judgment are essential.

An order of priority for initiating non-war or civilian production must be prepared beforehand. The schedule of resumption of peacetime production should be governed by the amounts of

materials, manpower and facilities that are available as well as by the relative needs or importance of different products. There will be strong competition for priority among the various kinds of consumer goods, equipment needed for reconversion, producers goods required for expansion and modernization, and export demands. Relative need obviously is the most compelling criterion. But because of the importance of expediting reconversion, earliest consideration is urged for the tools and fixtures and models which will expedite large-scale civilian production when adequate labor and materials are available. In any case, advance schedules will be needed to avoid a makeshift, piecemeal lifting of controls on the basis of who shouts the loudest.

Another difficult problem of the reconversion period will be to keep to a minimum the distortion of inter-industrial and intra-industrial relationships. Many varieties of consumers goods compete for the consumer dollar, and some industries will offer strong resistance if the green light is given first to industries whose products may thereby acquire a time advantage.

Even more difficult will be the matter of competition between companies producing the same products. Some manufacturers may find themselves tied up with continuing war contracts with restrictions on their peacetime products suddenly lifted and their competitors free to take advantage of the situation. The declining need for different kinds of war materiel will vary greatly, and some producers inevitably will be available for peacetime production considerably in advance of some of their competitors.

This raises the question of victory models or nucleus plants to eliminate competitive advantages among producers of identical products pending the time when all are on an equal footing again. Policies controlling this should take into account the degree or the extent of competitive advantage which reconversion might bring, and also upon the time interval during which these advantages will prevail. Such programs necessarily mean increased government control, hence they should be adopted only under the most pressing circumstances.

There is the important question of termination as between large and small plants. Fairness must be exercised, and undue advantage to either group must be avoided in extending opportunities to continue receiving profitable war orders or in getting back into civilian production. The problems of small manufacturers must not be neglected in this period. Likewise, any restraints on new ventures and on more vigorous competition must meticulously be avoided.

There also is the question of communities which have been greatly enlarged and others which actually have been brought into being by the war. It might be advisable to terminate contracts in these areas first in order that the workers might be encouraged to migrate elsewhere while employment prospects are most favorable. Also, if continued production of some armaments is contemplated after the war, it might be well to concentrate this production in communities which otherwise would be stranded.

If the process of terminating contracts is to be geared into meeting continued demands for munitions and also expediting reconversion, then the Armed Services must accept broad policy considerations as criteria for cancelling contracts. Procurement officers might be inclined to cancel contracts with all high cost producers first. Or they might be inclined to cancel small producers first so as to reduce the administrative burden. Then again, they might cancel the newer producers of specific products rather than the older, time-tried manufacturers.

These procurement criteria may all be highly desirable and efficient but other important considerations such as those mentioned above must be given proper attention. ***Demobilization cannot be a separate process from reconversion.*** They must be united. The termination of contracts is a demobilization task, but I am confident that the procurement agencies appreciate the importance of this operation in facilitating reconversion and that they will take full cognizance of the policies necessary for giving every assistance to initiating peacetime production.

I have not attempted to raise all the important policy questions in terminating contracts, nor do I propose specific solutions for each major problem. Rather it has been my purpose to indicate the complexities of the task which faces us and to urge that intelligent and sound plans be developed now while there is time. By so doing, we can avoid the dislocations and economic disorder which otherwise might characterize the reconversion period. The better we are prepared, the more rapid will be the resumption of full employment and good business after the war is won.

This job of changing America's industrial pattern from war to peace speedily and efficiently, is one which will tax the talents and knowledge of the ablest business men of the country. These men can, and I am sure that they will, attack this task with the same energy and determination that characterized their efforts in the period of mobilization for war.

Industry advisory committees were established to cooperate with governmental agencies in the great task of conversion to a full war economy. These committees are the means through which industry has the opportunity to play a major role in the solution of the problems of reconversion. It must assume that responsibility or accept the consequences in the form of enforced government control. Industry must take a renewed interest in these committees and make certain that our best minds and strongest men are available for the challenging job of conversion which we face now. It is a job that must be done well if we are to have a good start on the road to a greater democratic and free enterprise nation

President, McGraw-Hill Publishing Company, Inc.

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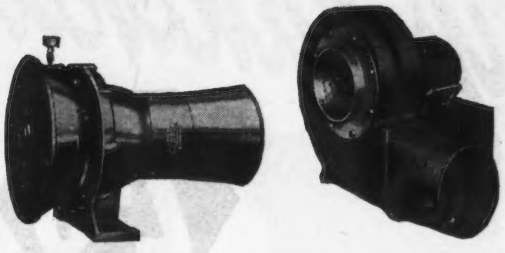

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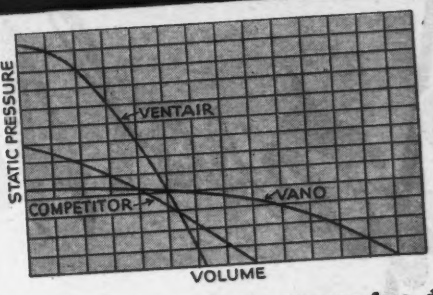

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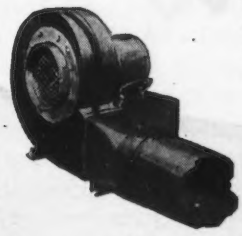

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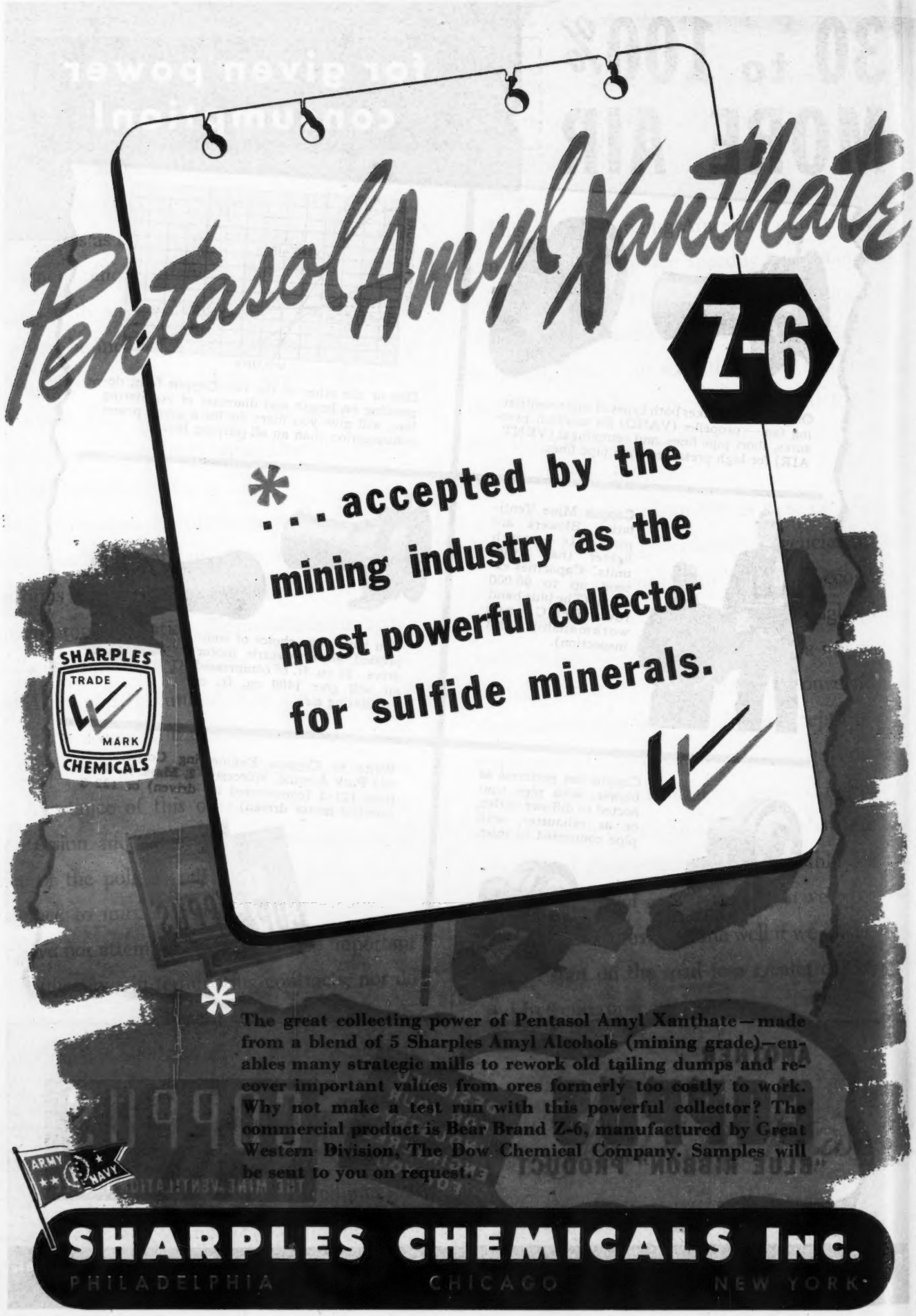
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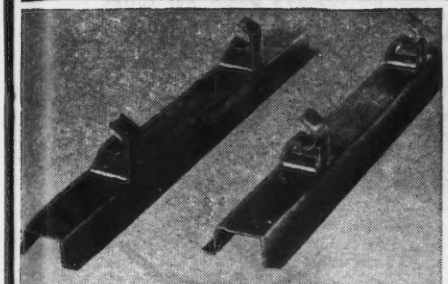

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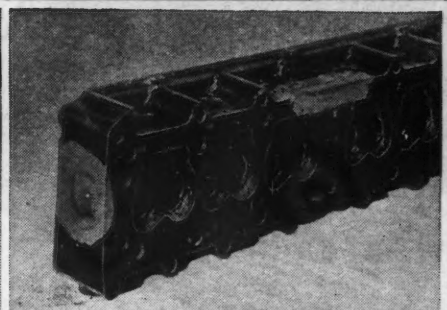

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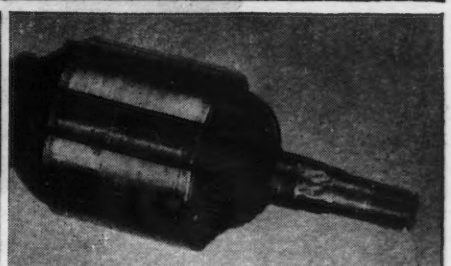

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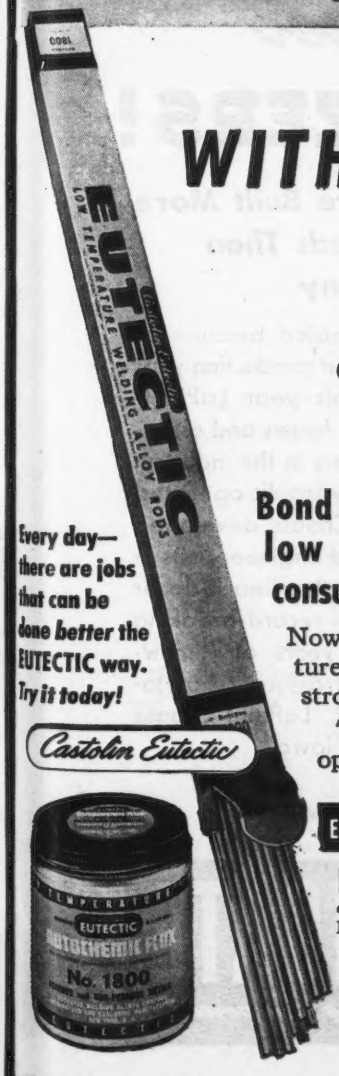

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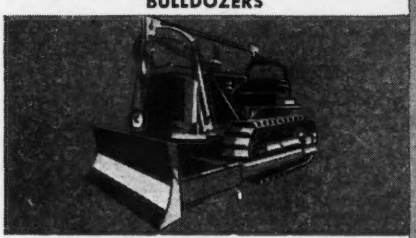

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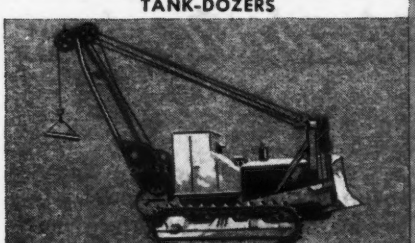

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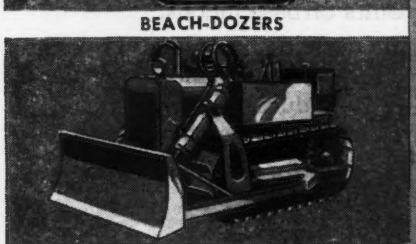

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....And LA PLANT-CHOATE *Comes first* IN BULLDOZERS!

Again in '44—LaPlant-Choate Built More Dozers for Essential Needs Than Any Other Company

While detailed figures cannot be revealed because of military censorship, 1944 was *the biggest production year in dozer history.* Moreover, again this year LaPlant-Choate built more dozers for the armed forces and essential civilian users than any other company in the industry. In addition to thousands of cable and hydraulic operated bulldozers and Pivot-dozers*, LaPlant-Choate developed and built hundreds of highly specialized engineer units—including the now famous Tank-dozer, the Beach-dozer and the small airborne Calf-dozer. This record-breaking production, plus LaPlant-Choate's *21 years of "know-how" in dozer engineering is your* best assurance of tomorrow's best buys in dozer equipment. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa.

LAPLANT-CHOATE

America's Oldest and Largest Manufacturer of Dozers

**Trade-mark applied for*

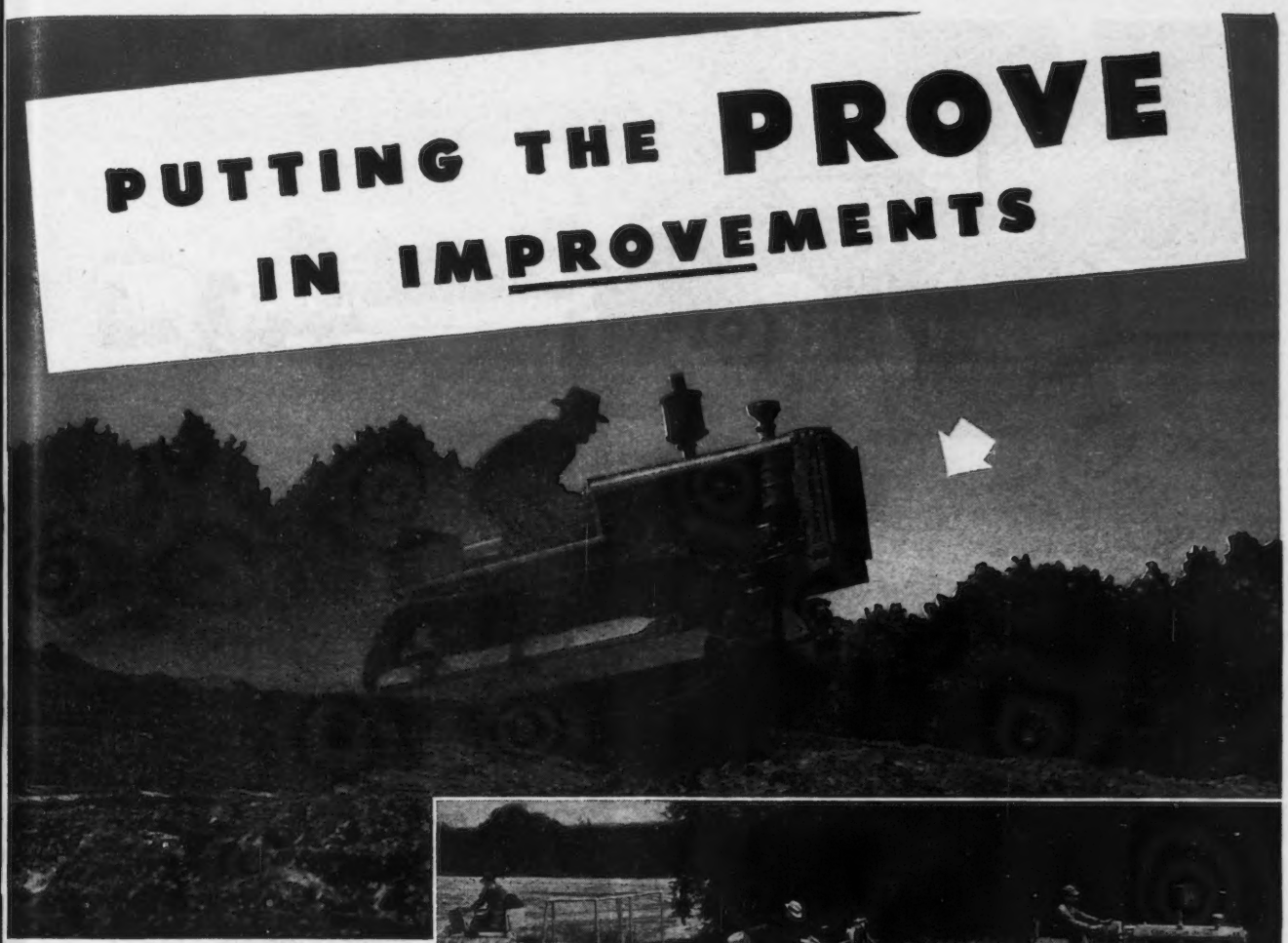
Note the three stars—LaPlant-Choate is one of the few companies in the construction equipment industry to have won the Army-Navy "E" award of merit—four times in a row.

ARMY E NAVY

LaPLANT-CHOATE

Earthmoving and Land Clearing Equipment

PUTTING THE PROVE IN IMPROVEMENTS



• *This bucking bronco is a "Caterpillar" Diesel D2 Tractor taking one of the many "hurdles" that are designed to test its toughness on the "Caterpillar" Proving Grounds.*

• *A "Caterpillar" Diesel D4 Tractor pulling a drawbar dynamometer and loading car to test the pulling power of a certain grouser design in various kinds of soil surfaces.*

IF YOU happen to be a long-standing "Caterpillar" Diesel user, you know that changes and improvements go into "Caterpillar" Diesel products the minute they're ready and right. There's never any waiting for "yearly models."

Through the years, "Caterpillar" has given you such notable refinements as copper bellows seals for final drive, oil coolers, absorbent-type oil and fuel filters, finger-tip steering, "Hi-Electro" hardening for many vital parts, multispeed transmissions and scores of others. The economy and dependability of the "Caterpillar" Diesel have been constantly improved. Only the basic design remains unchanged. It was *right* from the start.

Every improvement that has ever gone into a "Caterpillar" Diesel product has first been subjected to the stiffest laboratory and proving-ground tests. The net result is Product Dependability. With every manufacturing step controlled by one organization in one factory, there can be no possibility of compromise with quality.

Dependability is the outstanding characteristic of your "Caterpillar" dealer, too. Today he is in a position to give your "Caterpillar" Diesel equipment the kind of inspection, adjustment, maintenance and repair it needs to work at peak efficiency from now until Victory is won. You'll find it profitable to consult your "Caterpillar" dealer regularly.

Caterpillar Tractor Co., San Leandro, Calif.; Peoria, Ill.

• • •

***DEPENDABLE* is the word for "Caterpillar" Diesel**

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

TO WIN THE WAR: WORK—FIGHT—BUY MORE WAR BONDS!

NO Compromise HERE!

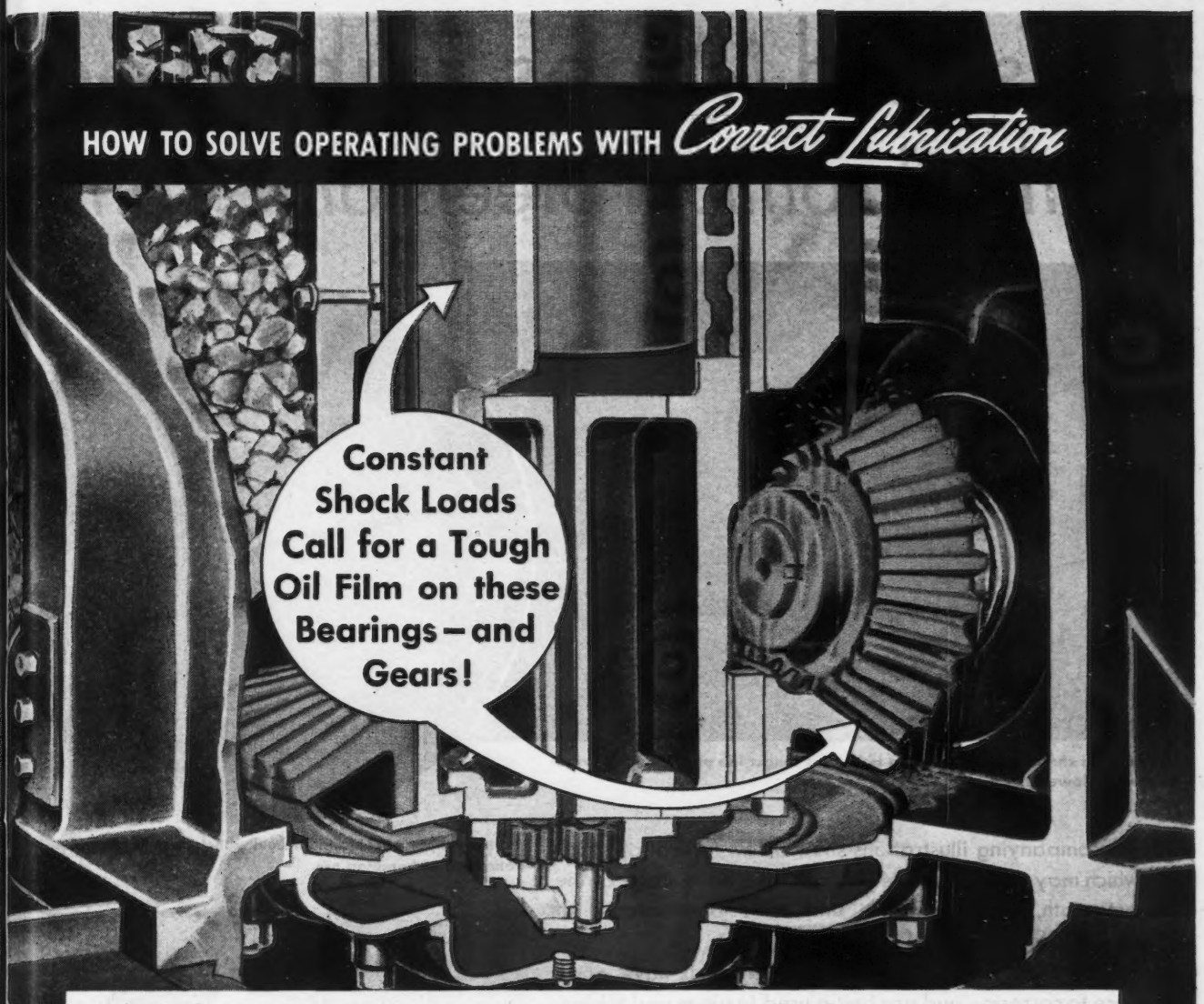
Rear-Dump and Bottom-Dump EUCLIDS are designed and built for a single purpose — to move earth, rock, coal, ore and other materials on off-the-highway hauls with speed and economy. Planetary type full-floating drive axle, greater flotation and tractive power, and heavy construction throughout . . . all of these features make Euclid equipment outstanding for dependable performance and lower hauling costs.

Because they are built exclusively for hauling large loads on difficult hauls, there is no compromise in the design or the construction of Euclids. Weight is kept to a minimum consistent with large capacity and long life on tough jobs. Hundreds of earth moving contractors, and industrial owners too, have proved conclusively that Euclids cost less to own and operate on both long and short hauls.

The EUCLID ROAD MACHINERY Co. · · · Cleveland 17, Ohio

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH · ROCK · COAL · ORE

HOW TO SOLVE OPERATING PROBLEMS WITH *Correct Lubrication*



Cushion the Shocks

IN YOUR CRUSHER!

THINK of the terrific shock loads that your crushing operation imposes on bearings and gears! And then think of the kind of oil you need to protect those metal parts!

You can count on Gargoyle Vactra Oils for this job. Proved in crushers all over the world, these high-quality oils form *strong, persistent* films that resist rupture under severe pressures. Moreover, they flow freely at low temperatures to permit easy starting even in the coldest weather.

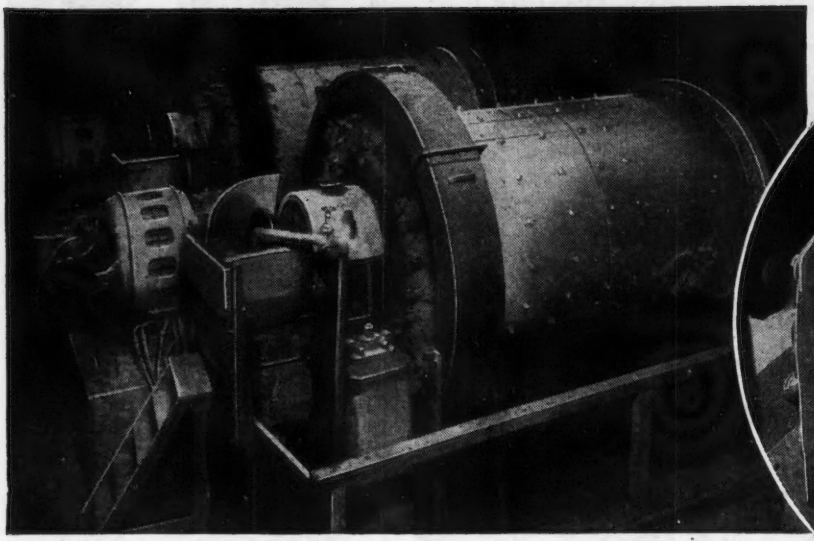
You reduce wear, shutdowns and maintenance costs to an absolute minimum. You're assured of *more continuous production* the year 'round. See your Socony-Vacuum representative for these oils.

GARGOYLE Lubricants

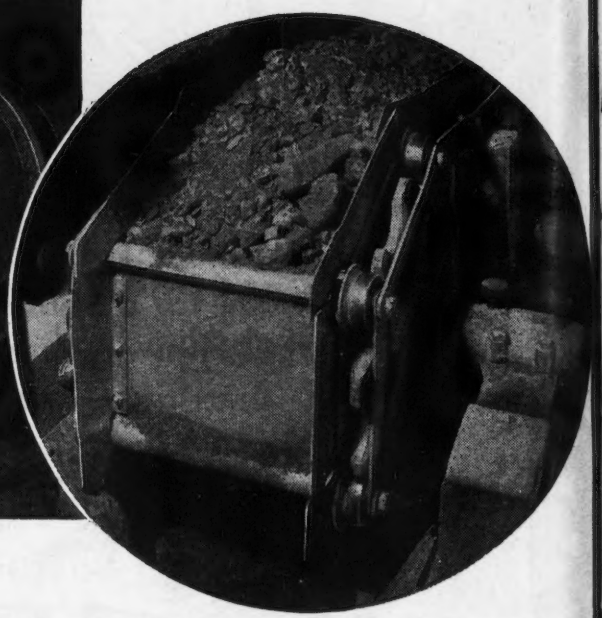
SOCONY-VACUUM OIL CO., INC., Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. • White Eagle Div. • Wadhams Div. • Magnolia Petroleum Company • General Petroleum Corporation of California.

CALL IN SOCONY-VACUUM

Mills and Mines Fight Wear
with Chromium Steels and Irons



Three per cent chromium-iron grinding balls give longer life and mean that grinding costs are lower.



Conveyor parts of chromium steel withstand the severe impact and abrasion of handling ore.

● The accompanying illustrations show a few typical applications which may suggest where you can take advantage of the extra strength, wear-resistance and corrosion-resistance of chromium steels and irons.

For instance, 4 to 6 per cent chromium steels have good resistance to corrosion and are being used in pipes and tubing. The 18-8 chromium-nickel stainless steels, which resist abrasion and give much longer life in corrosive atmospheres, are being used for wire rope and shaker screens.

The higher chromium steels have maximum resistance to oxidation and abrasion, and are being used for rabble arms, chutes, conveyors, and crushing machines. Chromium cast iron resists growth, distortion, and wear, and is suitable for many furnace parts, such as grate bars, door liners, and other parts exposed to heat.

We do not make steel of any kind, but throughout our years as a producer of ferro-alloys and metals used in making steel, we have accumulated a fund of data on alloy steels. This information is available to aid you in selecting suitable alloy steels and irons for specific applications of chromium irons and steels in mining practice.

BUY UNITED STATES WAR BONDS AND STAMPS

Dipper buckets are made tough and abrasion-resistant with manganese and chromium.

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
Trade Mark
Ferro-Alloys & Metals

Yesterday

"like salt and pepper"

They Go Together!

BAKER BULLDOZERS and ALLIS-CHALMERS TRACTORS

Today

BAKER

Ever since the first Allis-Chalmers tractor was built over two decades ago, Baker hydraulic bulldozers have been designed and constructed for use with them. From that day to this, there has always been a Baker for every model Allis-Chalmers crawler tractor. Bakers are not adapted to—*they're built specifically for*—Allis-Chalmers tractors. Like salt and pepper, bacon and eggs, or bread and butter—*they go together!*

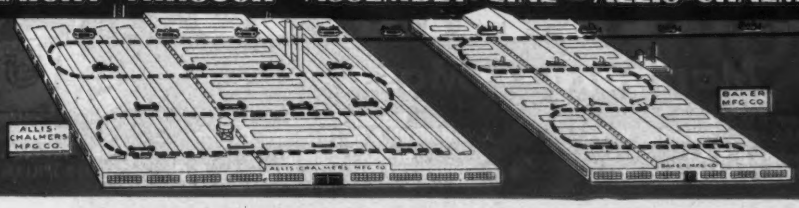
Baker engineering has kept pace with the progressive improvement of Allis-Chalmers tractors until today the modern Baker bulldozer is the ultimate in serviceful, low cost, easy-to-maintain earth moving equipment. Now, as always, there is a Baker bulldozer and gradebuilder for every model of Allis-Chalmers crawler tractor — described in Bulletin 839. Bakers are sold exclusively by Allis-Chalmers tractor dealers *everywhere.*

THE BAKER MFG. CO.

532 Stanford Ave. Springfield, Ill.

If it Concerns Victory, it concerns us!

"STRAIGHT THROUGH" ASSEMBLY LINE – ALLIS-CHALMERS TO BAKER TO YOU!



The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow court and goes on the Baker final assembly line.

FOR OVER 30 YEARS

SEE *Safety Efficiency Economy*

with WHEAT

THE APPROVED CAP LAMP

Underground Safety Established
...WHEAT Approved
SHOT-FIRING DEVICE

For over 30 years safety, efficiency, and economy have been combined in the WHEAT approved electric cap lamp to make it the outstanding mine safety lamp.

For over 30 years WHEAT has helped to create greater coal productivity with safety — reduced fatalities per ton. Steadier, brighter light throughout the entire shift has helped to increase mine output over 20% per man day.

WHEAT electric cap lamps and batteries cost less, are more economical to operate. WHEAT Self Service System and the short time required for watering batteries insure marked savings in the lamp house operation.

The results obtained in increased production with lower accident rate and lower cost per ton, will repay close study by those interested in cost-reduction and employee welfare.

SPECIALISTS IN MINE LIGHTING FOR 30 YEARS

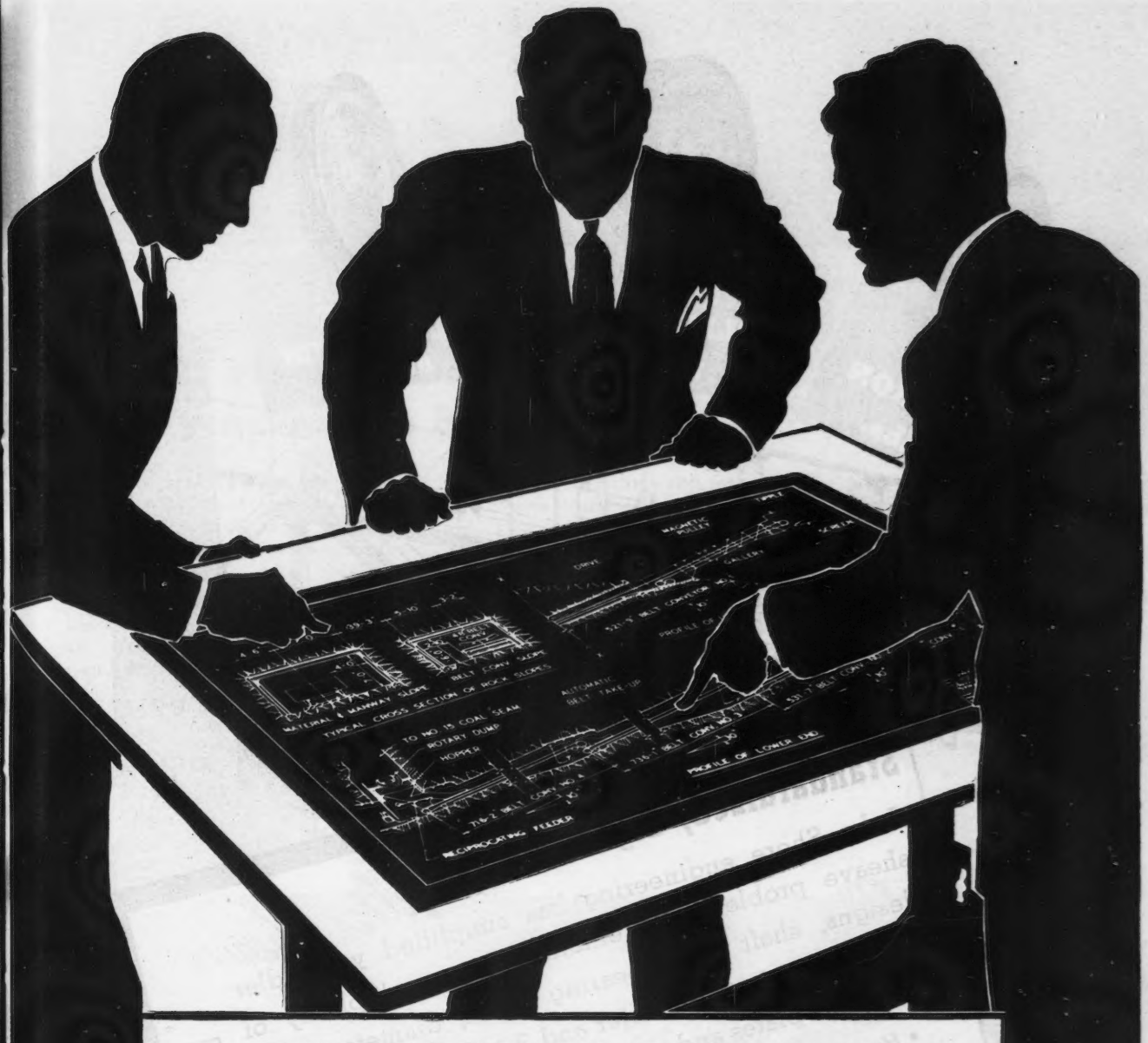
KOEHLER MFG. CO.

Marlboro · · · Mass.

Eastern U. S. A.:
WHEAT LAMP SALES INC., Charleston, W. Va.
Western U. S. A.:
E. D. BULLARD CO., San Francisco, Cal.

Eastern Canada:
H. C. BURTON & Co., Hamilton, Ontario
British Columbia:
B. C. EQUIPMENT CO., LTD., Vancouver, B. C.

BETTER LIGHT - LESS WEIGHT
NON-SPILLABLE



3 ENGINEERING TECHNIQUES

ARE ESSENTIAL

The skills of three separate engineering staffs determine the design of your U. S. Rubber Conveyor Belts.

For every conveyor belt must be individually engineered, if it is to prove satisfactory in all respects. The particular conditions under which it will operate must be known and considered.

The design and construction of a U. S. Rubber Conveyor Belt, therefore, is influenced from the time a mine or quarry is planned.

Long before we produce a belt for you, our engineers have held two vitally necessary consultations: one with your engineers *at the scene of service;* another with the makers of the mechanical conveyor equipment installed.

Only through such coordinated effort can a conveyor belt be properly designed and built. All three groups must make their technical contribution in developing belts that can be relied on for long, economical service.

SERVING THROUGH SCIENCE WITH **US** ***ENGINEERED RUBBER CONVEYOR BELTS***

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE • ROCKEFELLER CENTER • NEW YORK 20. N. Y. • *In Canada:* DOMINION RUBBER COMPANY, LTD.

Standardized, Lightweight *Idler Sheaves*

Lake Shore engineering has simplified your idler sheave problems by eliminating a multiplicity of designs, shaft sizes, bearing types, diameters, etc. Standard 20 inch diameter and 3 inch bore. Sheaves, liners, side plates and roller bearings interchangeable.

- *Hyatt Roller Bearings On Cast Steel and Aluminum Models.*
- *Replaceable One-Piece Rubber Liners.*
- *Demountable Side Plates.*
- *Lightweight Special Hollow Shafts Simplify Handling.*
- *Bell Mouth Design Eliminates Rope Jumping Out of Sheave.*

Write for new catalog No. 446 for complete information on standardized lightweight Idler Sheaves, Timken Bearing Type Head Sheaves, and Bicycle Sheaves.

Skips—Cages—Hoists—Sheaves—Cars—Grizzlies—Crushers—Conveyors—Snatch Blocks—Accumulators—Log Washers—Ball Mills—Sinking Buckets—Scrapers—Miscellaneous and Special Machinery and Equipment.

MINING DIVISION

LAKE SHORE

ENGINEERING COMPANY

Iron Mountain, Michigan

Main Plant at: Marquette, Michigan
Offices at: 15 Park Row, New York 7, N. Y.
417 Market Street, San Francisco 5, Calif.
2-260 General Motors Bldg., Detroit 2, Mich.

Look to Lake Shore for Leadership

THE SHOVEL WITH A BOARDING HOUSE REACH

It stacks away a lot of yardage in high places

To master a specific type of material handling, MARION developed the long-reach, high-lift shovel shown below. It is one of the most powerful machines for its size ever built.

It strips deep, tough, rock filled overburden from the working face of coal seams, lode veins, clay deposits and rock beds and disposes of it on top of high spoil banks and does the job speedily and at low cost.

The exceptional mobility of this BIG, little MARION has been proven under all pit conditions.

MARION engineers will gladly tackle your material handling problem.

It Pays To Modernize With MARIONS

THE MARION STEAM SHOVEL COMPANY • MARION, OHIO

ANOTHER MARION ACHIEVEMENT

CRANES • PULL-SHOVELS
CLAMSHELLS • SHOVELS
DRAGLINES • WALKERS

For Every Material Handling Job

3/4 cu yd to 35 cu yds.

BUY WAR BONDS

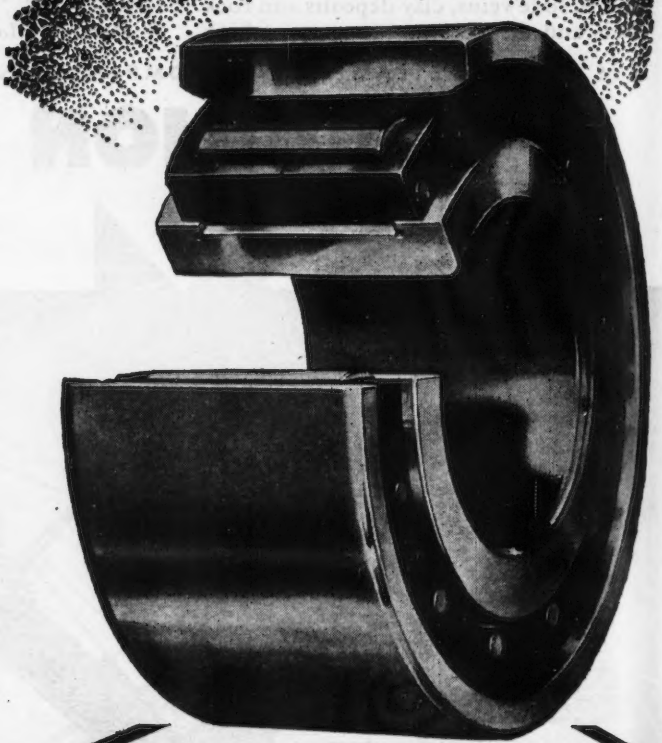
RIGHT-ANGLE LOADING REDUCES BEARING WEAR

Rollway Right-Angle Roller Bearings will make your machines *last longer* . . . with *lower power costs* . . . *lower maintenance costs* . . . and *lower replacement costs*. That's because Rollway's *right-angle loading* splits all compound loads into the two simple components of *pure radial* and *pure thrust* . . . and carries each of these components on a separate bearing assembly *at right angles to the roller axis*.

This load simplification reduces the unit loading on rollers and bearings. It insures lower starting and running torque. It holds radius-rub and roller-end wear-back to a minimum. And it eliminates all resultants from oblique loads, and all piling up of load magnitudes. Thus you get *a longer period of precision operation*. And you suffer *fewer shut-downs for bearing adjustment or replacement*.

Don't wait until reconversion problems overwhelm you. Take this important first-step toward postwar preventive maintenance today: Send drawings or detailed description of your postwar applications for free bearing analyses and recommendations by our engineering specialists. No charge. No obligation. S.A.E. and American Standard metric dimensions and tolerances are available for most applications, assuring quick supply and replacement at low cost.

ROLLWAY BEARING COMPANY, INC.
Syracuse 2, N. Y.
since 1908, makers of



Type MCS double-width Radial —carries all radial loads at right angles to the roller axis. Thrust loads are carried on a separate assembly.

ROLLWAY *Right-Angle Loaded* ROLLER BEARINGS

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Youngstown • Cleveland • Detroit • Chicago • St. Paul • Houston • Tulsa • Los Angeles

Get the RIGHT steel tie

FOR USE WITH MECHANIZED CUTTERS AND LOADERS

When you look at a Bethlehem No. 5 Steel Tie, you're apt to be impressed, first of all, by its ruggedness and "starch." This impression is strengthened when you handle it—for the No. 5, though easy to carry, weighs 5 lbs. per ft. of section; has plenty of guts to withstand the wear and tear of today's mechanized equipment.

Where heavy rail-mounted cutters and loaders are used, you simply can't afford light ties in your track layouts. They're poor economy, because the crushing weight of the motors and the cutting and loading machines will soon cause an undersized tie to buckle, bend, and start on its way to the junk yard.

For this reason, mine operators have been quick to recognize the advantages of Bethlehem's No. 5. It's specifically designed for the 40-lb. rail that is now so common in rooms, entries, and secondary haulageways. And its lasting qualities are demonstrated by the fact that it can be used over and over as layouts are removed—even when bottom conditions are not of the best.

It will outlast several sets of wooden ties, for there's no spiking and hence no spike-killing. Simply slip a No. 5 under the rails and knock the rotating clips into place with a hammer. That's all there is to it. Removal is just as easy.

If you haven't yet investigated these husky steel ties, ask a Bethlehem engineer to explain their advantages. He'll be glad to point them out—with many case histories to back up his statements.

★ ★ ★ BETHLEHEM STEEL ★ ★ ★

3,000 r.p.m. bit speeds WITH SKF BALL BEARINGS

You get high bit speeds up to 3,000 r.p.m. with this air-driven Gopher 30 Diamond Drill, but at this rotating speed it is essential to reduce vibration in the feed screw to an absolute minimum. That's why SKF Ball Bearings are widely spaced on the drive quill and the feed nut. On upper and lower ends of the drive quill, SKF's assure the required steadiness to the feed screw. On feed nut and gears, SKF's also help to hold the feed screw firmly, practically eliminating the tendency of the screw to play or whip at both its rod and water swivel ends. Find out what SKF Bearings can do on your machinery by *using* them. 5692

SKF INDUSTRIES, INC., PHILA. 34, PA.

SKF Puts the Right Bearing in the Right Place

DEEP-GROOVE BEARINGS

Single row with deep, uninterrupted raceways permitting radial and thrust loads in either direction. Groove curvature conforms closely to balls, resulting in large contact areas.

One or more of these types are used here—

CYLINDRICAL ROLLER BEARINGS

A single row of cylindrical rollers guided by flanges. Long contact surfaces between rollers and races. Also made with two rows of staggered ultra-precision rollers.

SELF-ALIGNING BALL BEARINGS

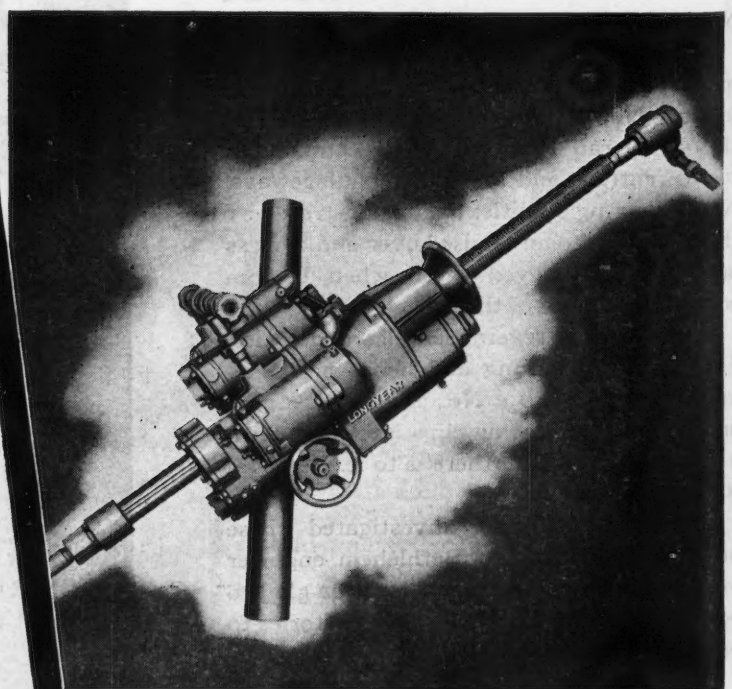
Self-contained. Their inherent property of alignment insures full capacity while compensating for any inaccuracies due to initial misalignment, shaft deflections, distortions or weave.

SPHERICAL ROLLER BEARINGS

Also self contained. Completely self-aligning for extra heavy radial and thrust loads or for severe shock conditions. Barrel-shaped rollers in a uniform path assure positive roller guidance.

These bearings never need adjustments . . . require only minimum lubrication.

SKF
Ball and Roller BEARINGS



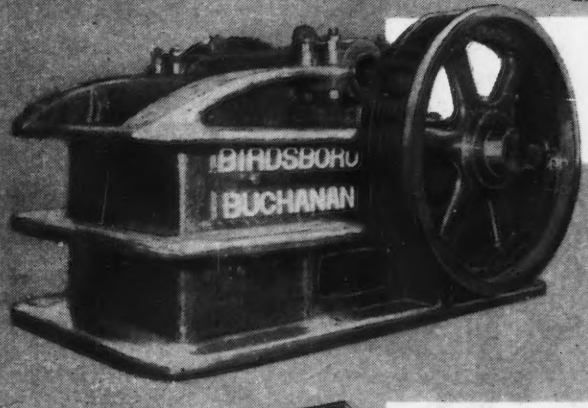
● *Built by E. J. LONGYEAR CO.*

BIRDSBORO-BUCHANAN ABC JAW CRUSHERS

FOR YOUR TOUGH CRUSHING REQUIREMENTS

Your tough crushing jobs can be completed with maximum speed and minimum cost with BIRDSBORO-BUCHANAN CRUSHERS. Below you will find a range of crusher types to handle light, medium, and heavy crushing assignments.

TYPE A—BIRDSBORO-BUCHANAN Type A Overhead Eccentric Jaw Crusher is designed for finer, faster crushing. It is manufactured with solid cast steel frame and roller bearings, in a range of sizes to suit all modern plant requirements.



TYPE B—BIRDSBORO-BUCHANAN Type B Jaw Crusher has recently been redesigned and new features added to assure lower maintenance costs. These heavy-duty crushers are built in sizes from 8"x 14" up to 18"x 36" inclusive.

TYPE C—BIRDSBORO-BUCHANAN Type C and Type C Deep Frame Jaw Crushers* represent the most advanced designs in large jaw crushers. The deep frame series allows a much greater reduction in the primary crushing stage. Available in sizes from 24"x 36" up to 60"x 84".

* PATENTED

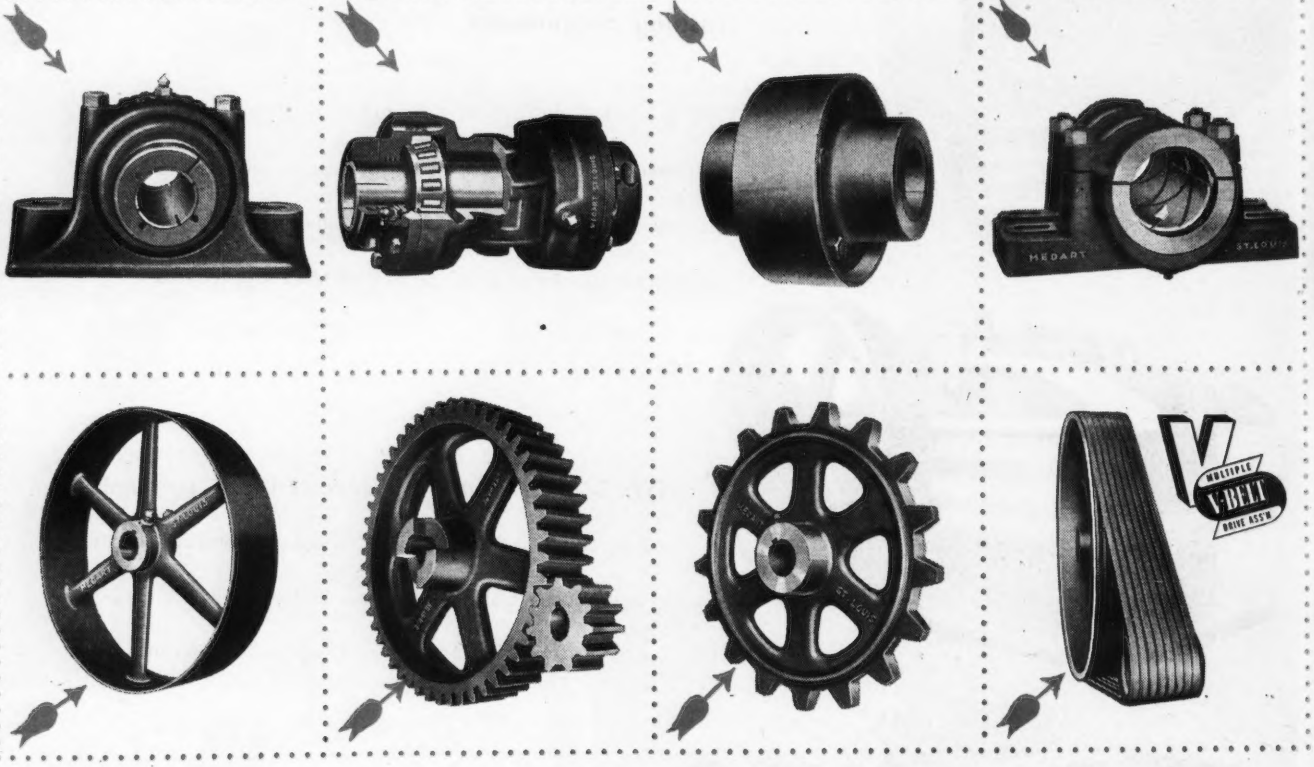
BIRDSBORO STEEL FOUNDRY & MACHINE COMPANY
BIRDSBORO, PENNA.

BUY WAR BONDS

BIRDSBORO
BUCHANAN JAW CRUSHERS

UPS efficiency DOWNS costs...

COMPLETE POWER TRANSMISSION EQUIPMENT FROM A SINGLE SOURCE



- SHAFT HANGERS
- BICYCLE TYPE SHEAVES
- V-BELT DRIVES
- CAST IRON PULLEYS
- STEEL RIM PULLEYS
- RING OILING BEARINGS
- WICK OILING BEARINGS
- BELT TIGHTENERS
- CHAIN DRIVES
- SET COLLARS
- HERCULES PULLEYS
- WOOD PULLEYS
- SHAFTING
- FRICTION CLUTCHES
- SPROCKETS
- PATTERN WORK
- RIGID SHAFT COUPLINGS
- FLEXIBLE SHAFT COUPLINGS
- UNIVERSAL SHAFT COUPLINGS
- MEDART-TIMKEN-BEARINGS
- IRON AND SEMI-STEEL CASTINGS
- WIRE ROPE SHEAVES
- CUT TOOTH GEARING
- MOLDED TOOTH GEARING

Manufacturing Engineers of Complete Transmission Equipment and Specialized Machinery

MEDART

THE MEDART COMPANY
3500 DE KALB ST., ST. LOUIS, MO.

Magnesite ore was hauled three miles from quarry to reduction plant by fleet of 10 Cummins Diesel-powered Kenworths equipped with 10-yard dump bodies. Trucks handled 2,000 tons of ore per day, plus 500 tons of waste rock. They also hauled reject fines for road maintenance.

Delivered to the crusher, the process of reducing crude ore to magnesium oxide began. Processed material was trucked 343 miles to metalizing plant in 22 Kenworths powered with 200 hp., supercharged Cummins Diesels and equipped with semi- and full trailer of 15-ton capacity each. Gross weight of each of these units is 105,020 pounds.

Basic Magnesium's trucking operation, which was under contract to Wells Cargo, Inc., involved 180,000 ton-miles and 12,000 truck-miles a day. Originally handled by truck and rail over a roundabout route of 1,148 miles at a cost of $8.25 per ton of oxide . . . the 22 Cummins-powered units, like that pictured at right, traveled a direct route of only 343 miles. Shipping cost was slashed to $4.58 per ton . . . oxide loss in transit reduced from 6% to ½%.

CUMMINS DEPENDABLE DIESELS

Automotive Models: Designed for all types of heavy-duty trucks in either highway or off-the-highway service.

★ ★ ★

Industrial Models: Portable and stationary engines, power units, and generating sets for service in any industry requiring heavy-duty power.

★ ★ ★

Marine Models: Propulsion engines and marine type generating sets designed for all types of fishing boats, work boats, and pleasure craft.

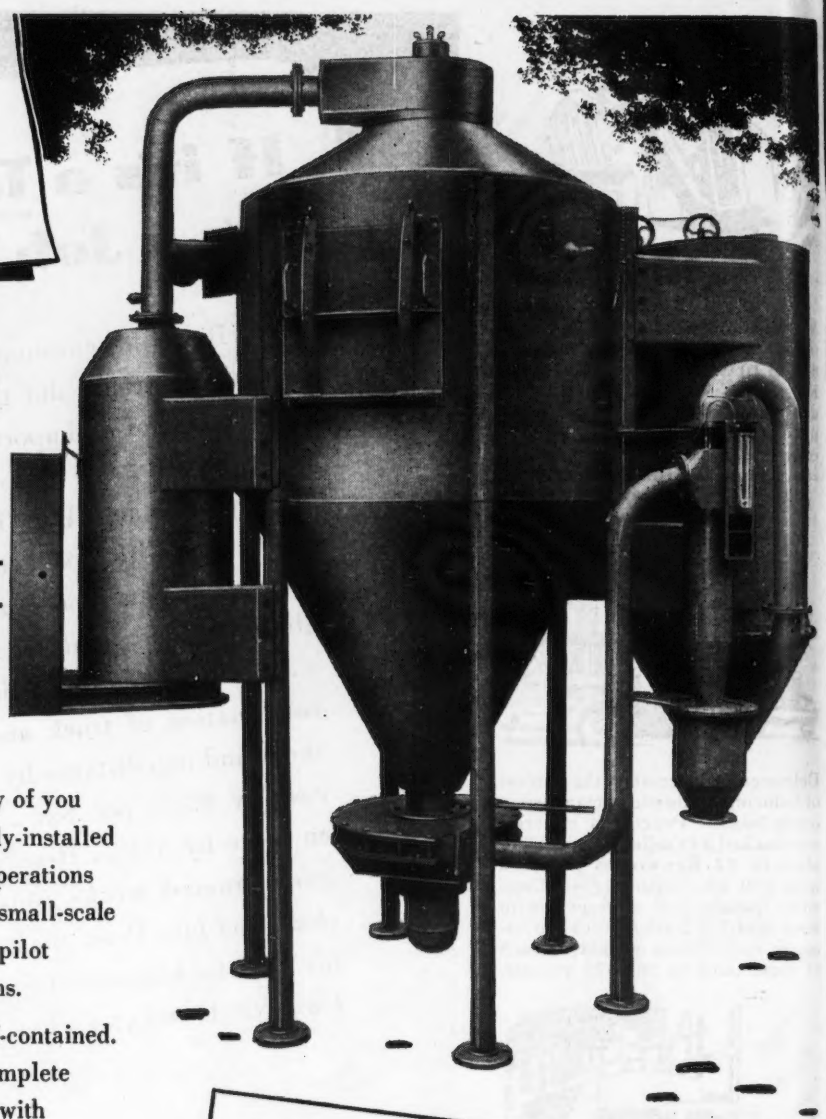
If it's a Tough Job.... It's a Job for Cummins

For Basic Magnesium, Cummins Diesel-powered Kenworth trucks did the entire haulage job in the production of all-important magnesium. Ten 15-ton units hauled 2,000 tons of crude ore to the ore reduction plant each day. Twenty-two double-bottom units, each with a payload capacity of 60,000 pounds, kept the magnesium oxide moving in a steady flow to the metalizing plant 343 miles away. Substitution of this 100% Cummins Diesel haul for the previous combination of truck and rail transport shortened the round trip distance by 1,610 miles . . . cut hauling cost by $3.67 per ton . . . reduced material loss en route by 5½%. Here, again, is proof that Cummins-powered trucks consistently move material—*cheap and fast.* Proof that, if yours is a *tough* job . . . it's a job for Cummins Dependable Diesels. CUMMINS ENGINE COMPANY, INC., Columbus, Indiana.

Advanced Information
on the
Newest Development in
Spray Drying . . .

the TURBULAIRE TYPE N SPRAY DRYER

. . . an economical, compact, completely self-contained unit for small-scale drying operations!



HERE's the spray drying unit many of you have been waiting for . . . a compact, easily-installed unit capable of a wide range of drying operations on various types of products—either on a small-scale production basis or for investigation and pilot plant operations on spray drying problems.

The Type N TURBULAIRE is completely self-contained. In addition to the desiccating chamber, complete with blower, it also incorporates a heater with variable temperature control as well as a MULTICLONE Collector and a bag filter for recovering the dried material from the circulating gases.

Developed by the same group of engineers that perfected the famous TURBULAIRE Spray Dryer widely used on modern large-scale drying operations, the Type N incorporates many unique operating features. Send for bulletin which describes in greater detail this new advancement in the spray drying field.

IMPORTANT FEATURES OF THE TURBULAIRE TYPE N DRYER!

CONSTRUCTION: Four foot cylindrical desiccator chamber has cone bottom for collection of dried product and hand operated mechanism for sweeping surface accumulations from interior of chamber. Standard equipment includes electric heater, Multiclone Collector, fan, bag house and control instruments all unitized into one compact assembly. Only electrical, compressed air and feed connections need be made.

SIZE: Complete unit occupies a floor space of only 5′ 0″ x 9′ 8″ and with headroom of 10′ 6″

ADAPTABILITY: Maximum operating flexibility is provided by optional heaters—either direct or indirect types—and secondary inlets for introducing tempering or precooled air. This permits handling thermoplastic and heat-sensitive materials as well as those which tend to case harden.

CAPACITY: The unit is rated at an evaporation of 25 pounds of water per hour at a temperature differential of 300°F. between inlet and outlet, but actual capacity may vary either above or below this figure depending upon exact nature of operation and material.

These are only a few highlights on the many features embodied in this new TURBULAIRE development. Write for literature which gives more complete details on the unit.

WESTERN
Precipitation
CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 140 S. DEARBORN ST., CHICAGO 3
HOBART BUILDING • SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

VALVE troubles result in excessive consumption of lubricating oil, rough running and stalling engines, hard starting. As a rule, most of these valve troubles are caused by mechanical difficulties, although some result from slow speed operation, permitting excessive deposits.

CHIEF CAUSES OF VALVE FAILURE

1. *Insufficient Tappet Clearance* . . . Correction lies in more frequent tappet inspection and accurate clearance adjustment.

2. *Valve Face or Seat off Center* . . . This trouble may result in heavy gum and coke deposits piling up on under side of valve head and forcing it off seat. Here correction lies in proper valve grinding, or replacement.

3. *Warped Valves* . . . Valves that are warped will apparently hang open at high speeds while clearing at idle. Reseating or replacement is only correction. Reducing abnormal temperatures will likely prevent repetition.

4. *Weak Springs* . . . Replace with springs meeting manufacturer's specifications for spring tension.

5. *Worn Valve Guides* . . . Guides become worn from dirt in air intake or oil resulting in coke or gum deposits that build up on valve stems because of excessive oil. This may be corrected by more frequent service of air cleaner or installing more efficient air cleaner; and replacement of worn guides.

6. *Deposits on Valve Seat* . . . This is the most frequent cause of leaky valves with consequent loss in power and fuel efficiency. Source of this trouble is usually heavy carbon or lead deposits in combustion chamber, very rarely from foreign matter within combustion chamber. Narrower valve seats and strong springs with more accurate grinding technique are remedies.

7. *High Temperature Exhaust* . . . Caused either by back pressure due to restricted exhaust system or poor carburetion or late timing. This condition results in warped valves and assists in building up varnish, lacquer, gum or deposits on valve stems, resulting in sticky and/or leaky valves. Cure is to clean out or replace muffler and tail pipe and improve combustion.

8. *Insufficient Cooling* . . . Caused by scale, rust or muddy deposits in water jackets; failure of water pump to deliver enough water; bad vanes in pump; slipping pump belt. In all cases cleansing or repairing of cooling system is called for.

MAIN CAUSES OF STICKY INTAKE VALVES

Intake valves rarely fail or burn because they are constantly cooled by incoming charge of air-fuel mixture. However, they do frequently stick, due to:

1. *Gum Content of Fuel too High* . . . Gum in fuel forms deposits around valve stem above guide and under valve head. To correct, change to fuel of proper specification.

2. *Worn Guides and Stems* . . . Since most of stem and guide wear is due to dirt and dust in air, remedy is more frequent service of air cleaner, or installation of larger capacity oil bath cleaner and, of course, replacement of worn guides and valves.

RING-FREE MOTOR OIL HELPS REDUCE VALVE TROUBLE

Correction of valve trouble is obviously a mechanic's problem. However, motor oil that penetrates fast—gets down around valve stems, and guides—reduces friction, and thereby prolongs life of valve. Macmillan Ring-Free Motor Oil has this quality of fast penetration. Furthermore, it is refined to withstand high engine temperatures. Ring-Free acts as a preventive for valve sticking, saving fuel consumption and costly repair bills.

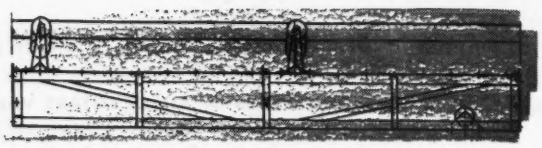
FREE BOOKLET

Write today for copy of free pamphlet on "Sticky and Burned Valves—Causes and Preventions." Address—Macmillan Petroleum Corporation, Room 1007, 530 W. 6th Street, Los Angeles 14, Calif.

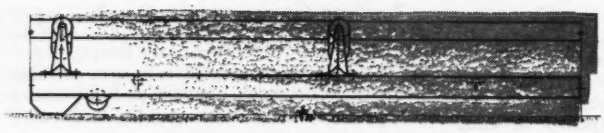
MACMILLAN RING-FREE MOTOR OIL

MACMILLAN PETROLEUM CORPORATION—50 WEST 50TH STREET, NEW YORK 20 • 624 SOUTH MICHIGAN AVENUE, CHICAGO 5 • 530 WEST SIXTH STREET, LOS ANGELES 14 • COPYRIGHT 1944, MACMILLAN PETROLEUM CORPORATION

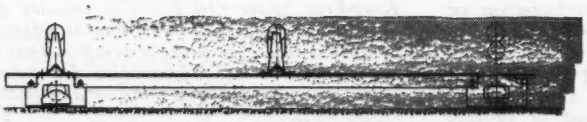
How B G CONVEYORS MEET VARIED MINE CONDITIONS



Truss Conveyor Frame
Built for Strength and Endurance



Channel Conveyor Frame
Ideal for Low Headroom



Low Seam Conveyor Frame
Designed for Frequent Moving

• From the wide variety of Barber-Greene *standardized* frames, terminals, power drives and take-ups, you can select those units best suited to the particular requirements of an underground conveying system in your mine.

Truss frames, for instance, are designed for main-entry duty. The truss design provides extra rigidity to maintain true alignment over uneven bottom curves and for long unsupported spans.

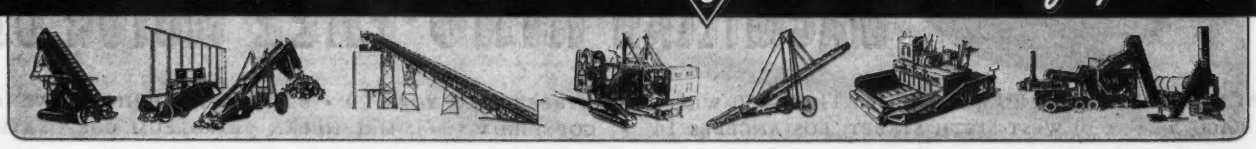
Channel frames have sturdy skid legs for low mounting directly on the mine floor. Just bolt the sections together — each one is a self-contained unit.

And when frequent extension or moving is required, the demountable frame of the low seam conveyor will save many hours of precious time.

Barber-Greene conveying equipment can be easily adapted to your mine. Mine Catalog 66 illustrates with many drawings and installation photos how B-G mine conveyors are now meeting a variety of mine conditions. For your copy, write to Mining Department, Barber-Greene Company, Aurora, Illinois.

44-68

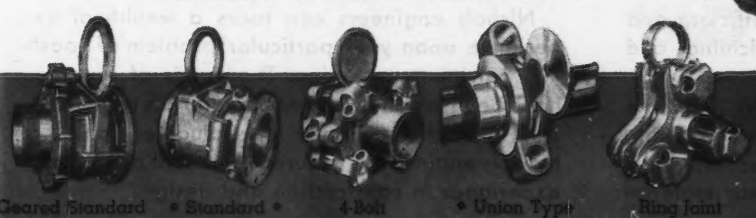
Barber-Greene B G *Constant Flow Equipment*



It's simple as ABC
The OLD Way—LINE BLINDING—The HAMER Way
CREW
TIME
1 or 2 Minutes
to
from MINUTES to HOURS
TOOLS
Figure the Cost Yourself
Add up the wages of the 3-man crew, the hours of labor, the tool inventory. Add in the ruined flange gaskets and add in the hazards. Then hear our story . . . complete engineering data in a new bulletin. Send for it now.
HAMER

HAMER 3-BOLT LINE BLIND

HAMER LINE BLINDS



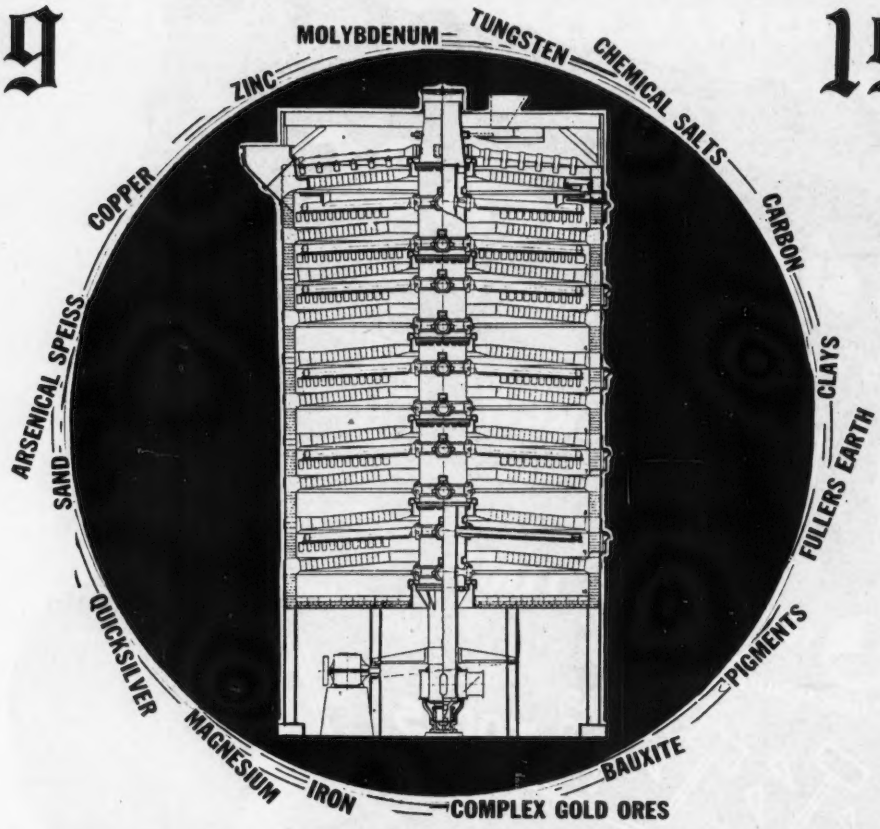
HAMER NON-STICKING PLUG VALVES

HAMER

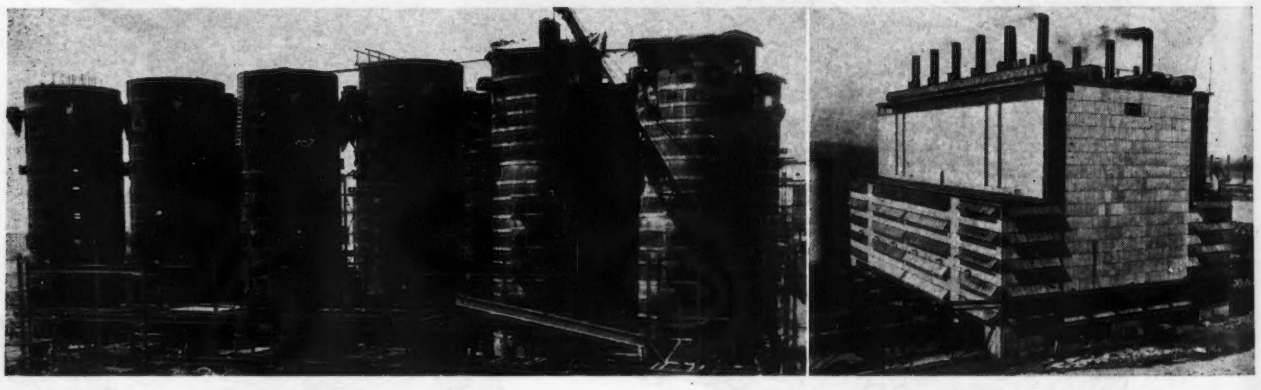
OIL TOOL COMPANY

2919 GARDENIA AVENUE
LONG BEACH 7, CALIFORNIA

1889



1944



Nicaro Nickel Company Plant

See E & M J—Feb. 1944—p. 106 for detailed description

Since 1889, when the first Nichols Herreshoff Multiple Hearth air-cooled furnace began roasting ores, continuous advancements in basic design have been made to assure an efficient and economcial means of roasting, calcining and drying.

Given above are a few of the many materials thermally processed in Nichols Herreshoff Multiple Hearth Furnaces with outstanding success. Illustrated is one of the largest vital war material plants, designed by Nichols, for roasting limonite and serpentine ores for the economical production of NICKEL.

Nichols engineers can focus a wealth of experience upon your particular problem of roasting, calcining or drying. Thousands of furnaces have been installed, scores of materials processed. This fund of knowledge is invaluable. Consult a Nichols engineer to secure the benefit of this long experience in construction and design.

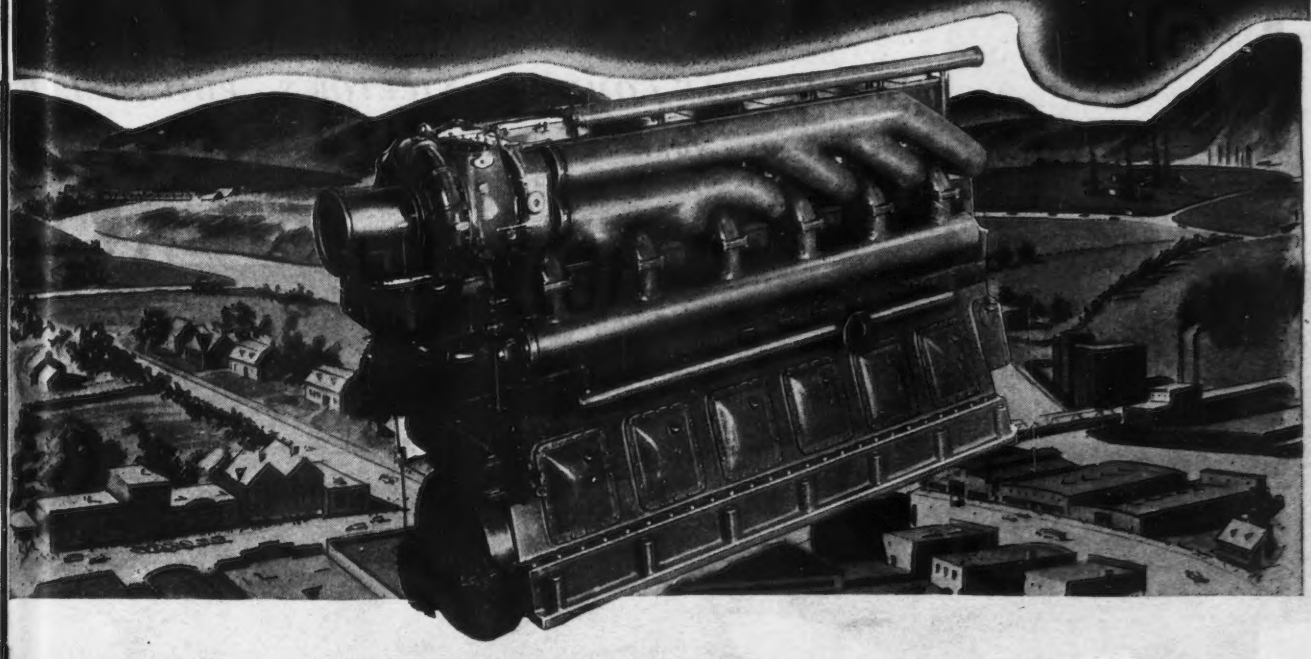
NICHOLS

ENGINEERING & NERCO RESEARCH CORP.

60 WALL TOWER

NEW YORK 5, N. Y.

MORE POWER TO YOU... AT LOWER COST



Worthington Turbocharged Heavy-Duty Diesels Save Money 4 Important Ways

In mines, oil fields, municipal and industrial power plants . . . Worthington 4-cycle, heavy-duty, *turbocharged* Diesels are delivering maximum power at lower cost. There are four big reasons why.

1. 50% more power in the same weight and space. Without sacrificing heavy-duty construction, a 50% increase in engine output assures a substantial saving in vital transportation and installation costs.

2. A 10 to 20% fuel-saving at partial loads, saving cost of fuel as well as fuel haulage in remote or rough country.

3. Sea level horsepower ratings at 14,000 feet. Turbocharger increases efficiency at high altitude.

4. Lower maintenance costs. 100% scavenging, improved combustion, fewer parts, mean long, uninterrupted service.

Investigate *all* rugged construction features, designed throughout for continuous, full-rated load, with a generous margin of safety: total enclosure, full force feed lubrication, conical cylinder heads, direct fuel injection, controlled cooling system, etc. Contact your nearest Worthington representative . . . District Sales Offices in all principal cities. *Worthington Pump and Machinery Corporation, Harrison, N. J.*

More than 2,000,000 installed Worthington engine horsepower now in service.

WORTH BEHIND THE NAME
WORTHINGTON

DE4-3

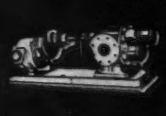
YOUR PARTNER IN POWER PROGRESS

WORTHINGTON-BUILT ENGINES AND AUXILIARIES

Diesel engines, 150 to 2,600 hp . . . gas engines, 175 to 2,880 hp . . . convertible fuel engines, 150 to 1,720 hp.

Starting Air-Compressors

Oil Transfer Pumps



Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

TOOL STEELS

Midvale tool steels come from the school of hard knocks. The are the outcome of shop experience in making our own tool for some of the toughest machining jobs in all industry. Th No. 1 Lesson is right steel. To get it in each case, we piled re search on research, test on test. Result is a full Midvale line o modern tool steels, available for ready delivery on priority orders

THE MIDVALE COMPANY • NICETOWN • PHILADELPHI

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
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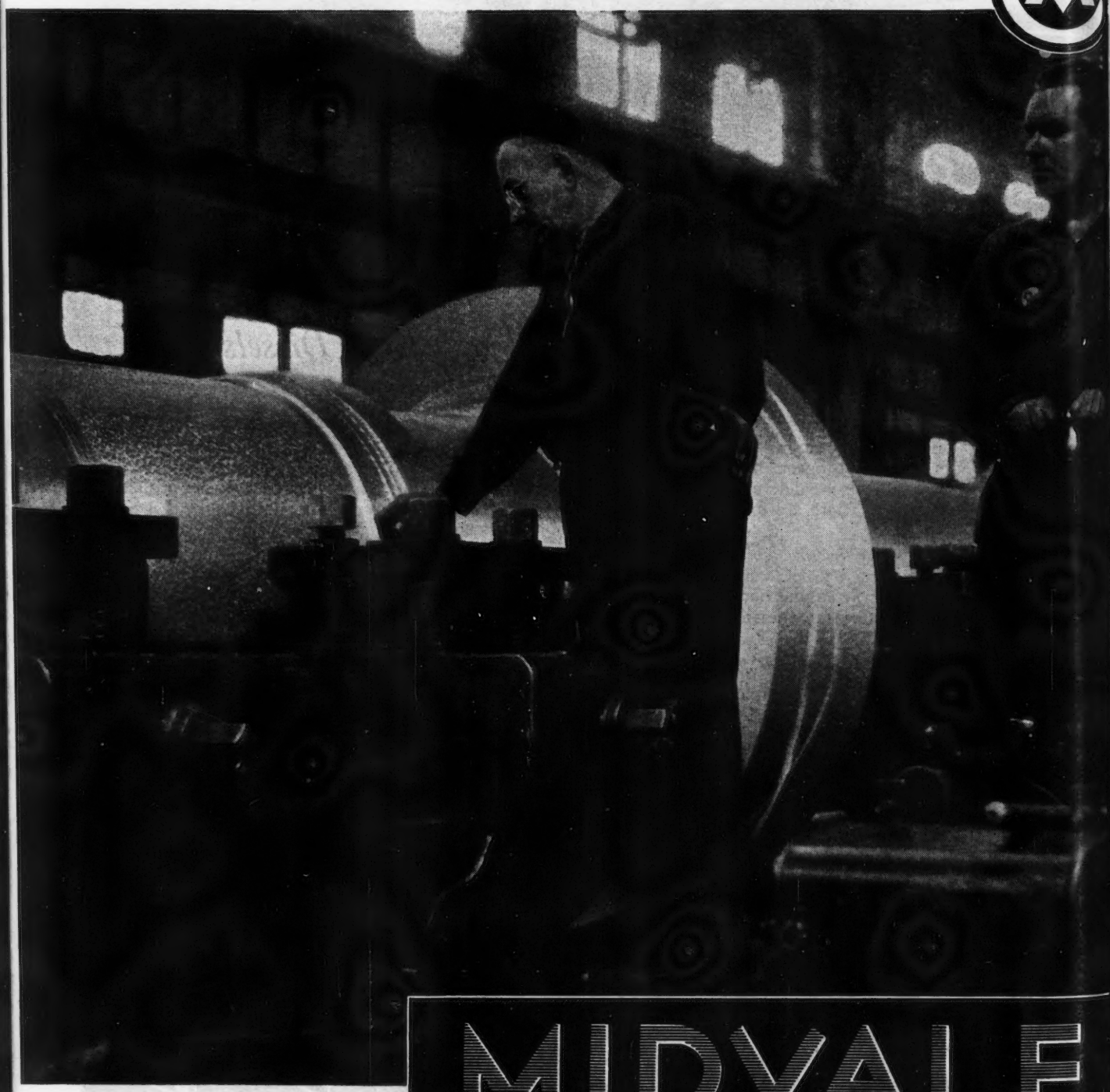


MIDVALE

Custom Steel Makers to Industry

TYPICAL DIESEL LUBRICATION PROBLEMS:

5. Liner Wear

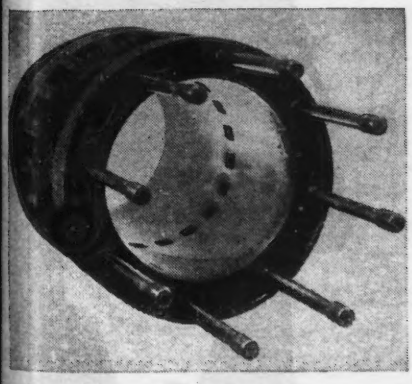
Wear on Diesel liners is commonly concentrated in the high-temperature belt near the combustion chamber. This is largely attributable to the inherent inability of most lubricating oils to "wet" hot metal surfaces.

Unlike spark ignition engines in which a partial vacuum in the combustion space during the intake stroke assists in drawing oil toward the upper compression rings, Diesels operate at or above atmospheric pressure in the combustion space which tends to drive oil away from the rings.

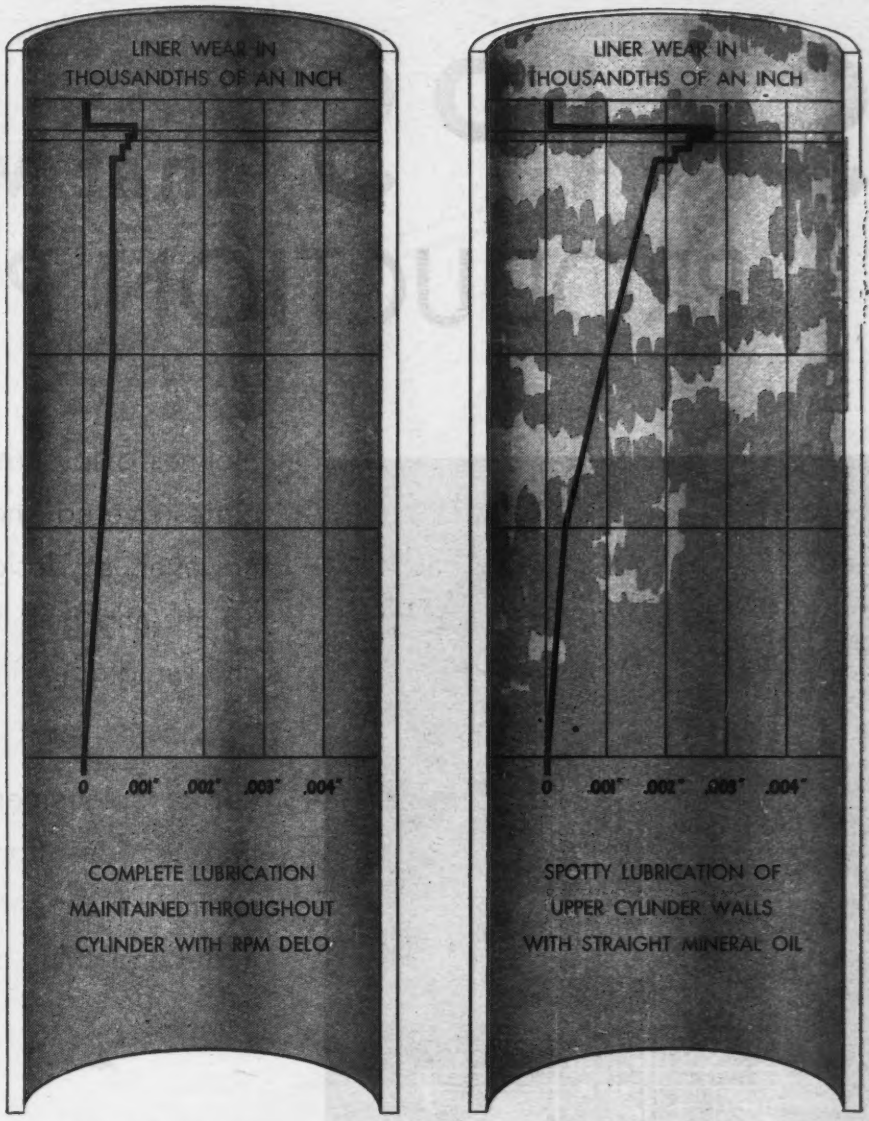
It is imperative then—to prevent relatively dry operation in the top piston ring high-temperature area—for the lubricant to have high-temperature adhesion characteristics.

To achieve this high adhesion factor under all operating conditions in RPM DELO Diesel Engine Lubricating Oil, a special compounding material was added. With this additive, RPM DELO will not run away from hot surfaces, thus preventing metal-to-metal contact on hot-running engine parts.

A typical example of the effectiveness of RPM DELO in preventing liner wear is offered by the Chicago, Rock Island and Pacific Railroad. One of its "Rocket"



Liner from Rock Island "Rocket" engine showing wear of only .001 in. after 157,076 miles on RPM DELO without an oil change.


LINER WEAR IN THOUSANDTHS OF AN INCH
0 .001" .002" .003" .004"
COMPLETE LUBRICATION MAINTAINED THROUGHOUT CYLINDER WITH RPM DELO
LINER WEAR IN THOUSANDTHS OF AN INCH
0 .001" .002" .003" .004"
SPOTTY LUBRICATION OF UPPER CYLINDER WALLS WITH STRAIGHT MINERAL OIL

These charts of one of the tests required by the Army in certifying oil for use in combat equipment, graphically illustrate (right) marked increase of liner wear in upper cylinder zone due to inability of straight mineral oil to provide full lubrication of this high-temperature area; and (left) reduction of liner wear by ability of RPM DELO to stick to these hot spots.

Diesel powered locomotives ran 157,076 miles on RPM DELO without an oil change, with liner wear of only .001 in.

Other causes of liner wear minimized by RPM DELO include:

1. Corrosion caused by carbonic and other acids at low temperatures.
2. Scuffing of liners from rocking of piston rings in worn grooves.
3. Scoring and scratching of liners due to stuck piston rings.

Reducing liner wear to a remarkable degree is but one of RPM DELO'S advantages in solving Diesel engine maintenance problems. Its other properties include: The ability of RPM DELO to eliminate ring sticking, to stop excessive deposits on rings and ports, and to prevent bearing corrosion.

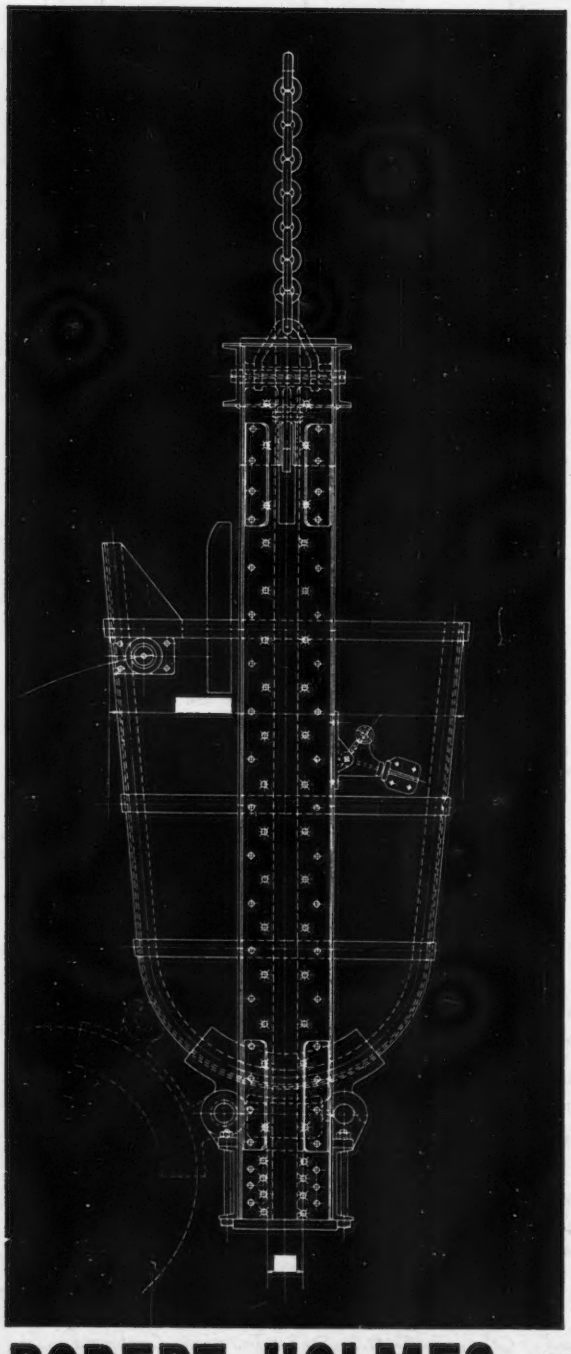
RPM DELO has world-wide distribution and is marketed under the following names: RPM DELO, Caltex RPM DELO, Kyso RPM DELO, Signal RPM DELO, Sohio RPM DELO, and Imperial RPM DELO (concentrate). Ask your Diesel engine manufacturer or distributor for the RPM DELO supplier in your vicinity.

RPM DELO

Write on your letterhead for free booklet on RPM DELO, *Standard of California, Dept. T-12, San Francisco, California*

STANDARD OF CALIFORNIA

SKIPS that whip PRODUCTION PROBLEMS



●

Holmes Skips are durably constructed of steel plates riveted and heavily reinforced. They are, however, so designed as to eliminate all excess weight and built to close tolerances for smooth and rapid operation.

●

Rapid replacement of worn parts is one of the first considerations in the fabrication of Holmes mining equipment. Built always to give the utmost in dependability and length of life.

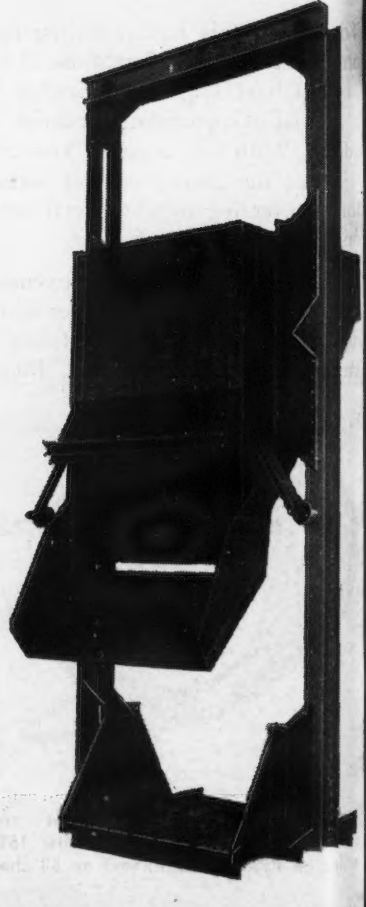
▲

DESIGNERS AND FABRICATORS OF MINING EQUIPMENT FOR OVER 70 YEARS.

■

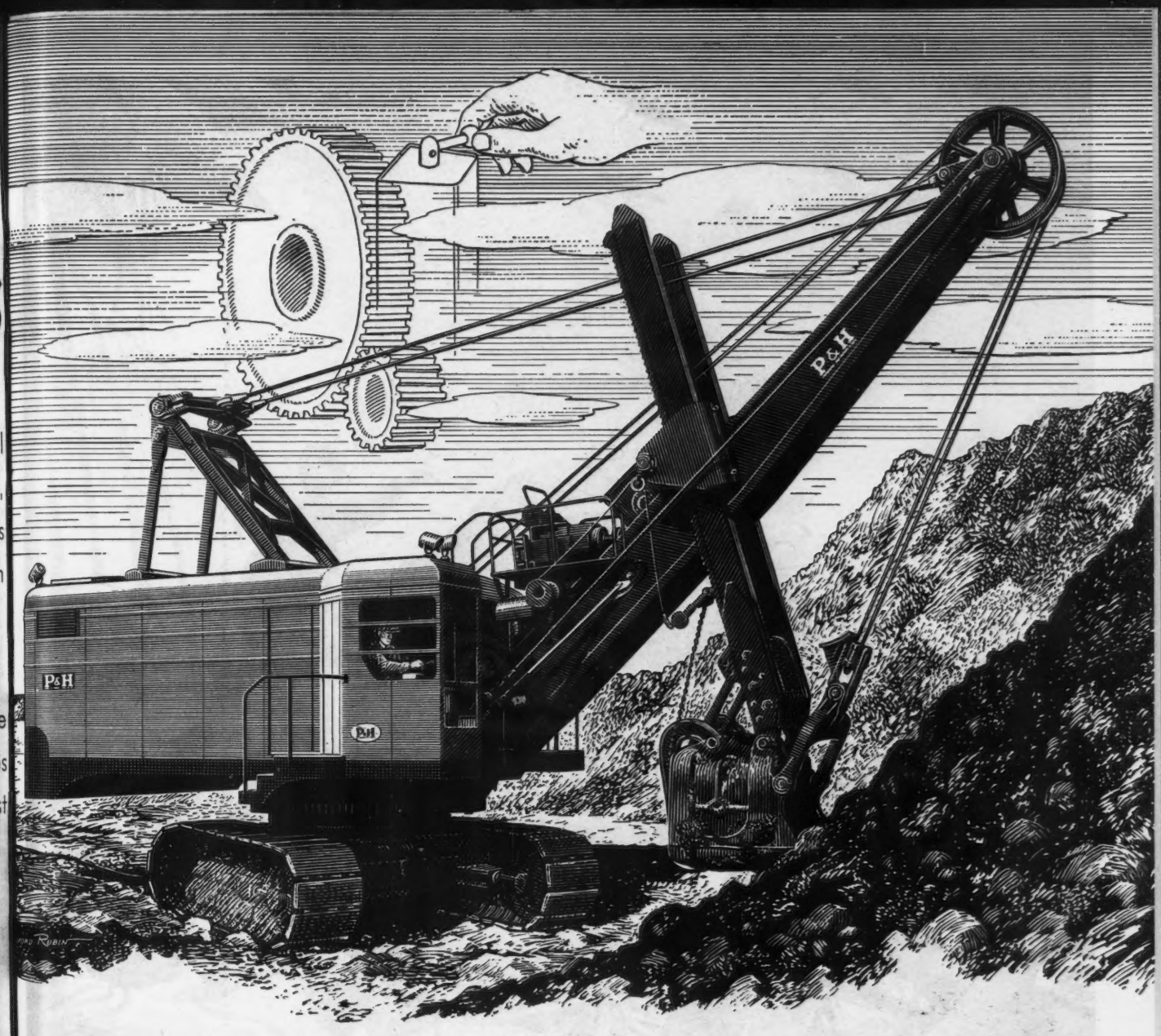
THE SERVICES OF OUR ENGINEERS ARE AT YOUR DISPOSAL

▼



ROBERT HOLMES AND BROS., INC.

DANVILLE, ILLINOIS



We Switched Out The Trouble of Gear Shifting

Here is simplicity itself . . . absolute freedom from the mechanical complications of transferring power from one shovel motion to another.

Powered by its own heavy duty, shovel-type motor, the P&H propel machinery is completely independent of all hoisting and swinging motions. P&H's independent propel drive means simpler, easier move-ups . . . it means less trouble, less time out.

The change from dig to propel is instantaneous on a P&H Electric Shovel — accomplished by a mere flick of the master propel switch. Sliding gears and mechanical clutches with their complicated mechanisms are entirely eliminated — there is far more time for actual digging.

Here is another important advantage in the interests of lower tonnage costs for all kinds of open-pit operations. Behind it is P&H's 60-year leadership in applying electrical power to the movement of heavy loads.

P&H ELECTRIC SHOVELS

4454 West National Avenue
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HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS P&H HOISTS • WELDING ELECTRODES • MOTORS

THE GREATEST FORWARD STEP EVER MADE IN ELECTRIC SHOVEL DEVELOPMENT

COPR. 1944 MACK MFG. CORP.

SOMETHING YOU CAN'T CAMOUFLAGE . . .

Our army can paint a Mack or any other truck to hide it from enemy eyes. But nothing about a truck can be camouflaged from its driver. That fact sent thousands of men home from the front after World War I to become Mack boosters. And this time Macks are even better! . . . Returning service men will know what you mean when you use the words "built like a Mack" to describe something tough and dependable.

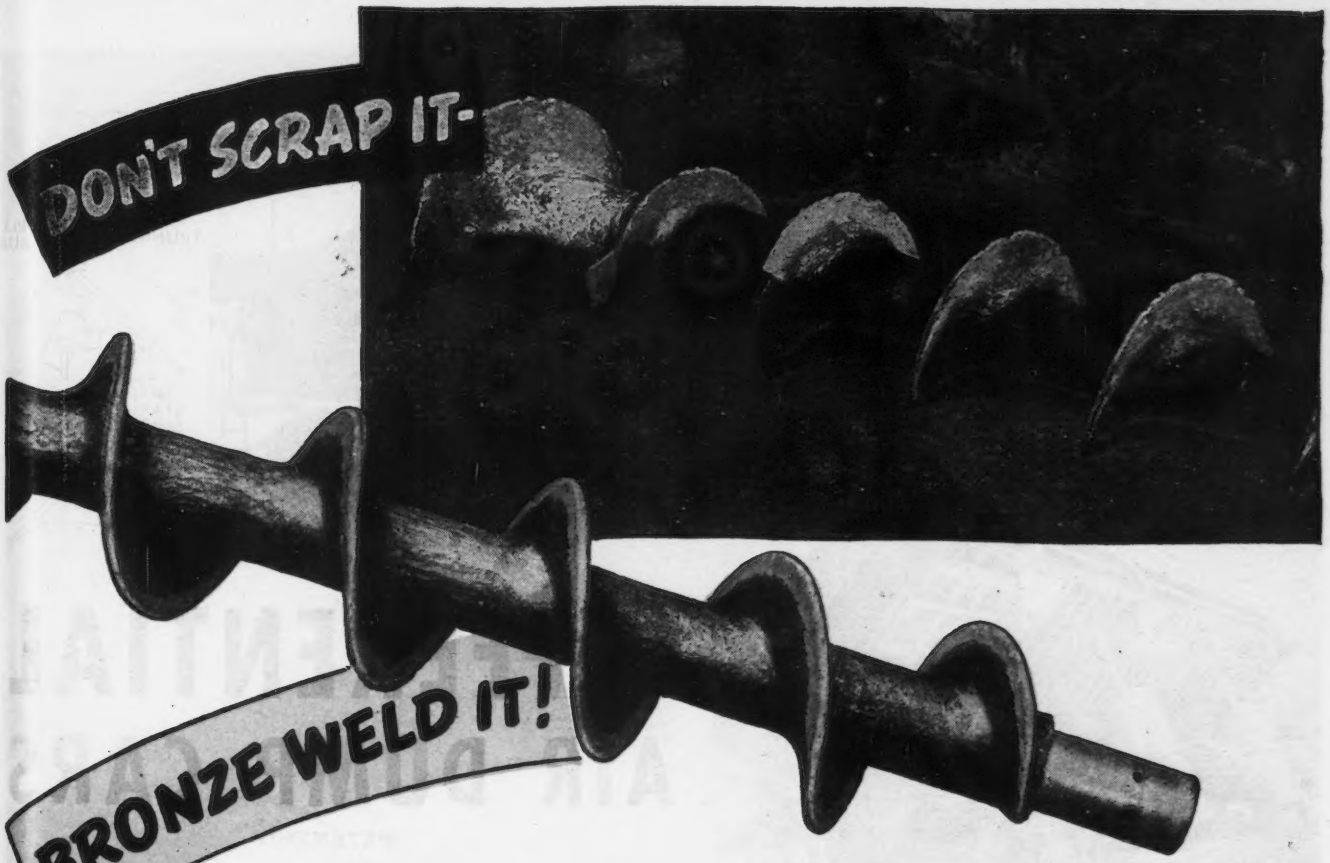
Mack Trucks, Inc., Empire State Bldg., New York City. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts.

Mack

TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

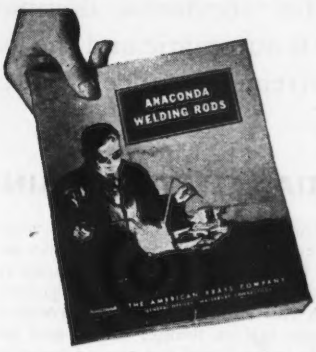
BUY U. S. WAR BONDS

IF YOU'VE GOT A MACK, YOU'RE LUCKY . . . IF YOU PLAN TO GET ONE, YOU'RE WISE!



Build up worn surfaces *quickly* ...at a fraction of replacement cost

Here's the answer to how, when and why...



The American Brass Company pioneered in the development of Bronze Welding and has a suitable rod for almost every gas or electric Bronze Welding purpose. Anaconda Publication B-13 describes these rods and suggests procedures for their use. A copy is yours for the asking.

It's hard to imagine any kind of industrial equipment taking a worse beating than a spiral feed screw. Under tons of wet coal or in a hot ash pit, corrosive and abrasive action are ever-present. To a well known mid-western railroad shop, continual replacement because of worn outer edges proved not only too expensive but unnecessary. Bronze Surfacing was found to be fast—and far more economical.

Welding rods such as "997" Low-Fuming and Tobin Bronze* are extensively used with the oxy-acetylene torch to deposit high strength, dense and tough weld metal on cast iron, malleable iron, steel and copper alloys. By this building-up process many shops are daily saving countless dollars by reclaiming worn parts and industrial equipment:—Sheaves, pulleys, bushings and bearings, pistons, impellers and pump parts, stripped threads and broken gear teeth, thrust plates, hubs, flanges, parts machined undersize, etc.

In addition, low temperature Bronze Welding offers a ready means of repairing broken or fractured production equipment and machine tools. Next time, "Don't Scrap It—Bronze Weld It!"

*Reg. U. S. Pat. Off.

THE AMERICAN BRASS COMPANY

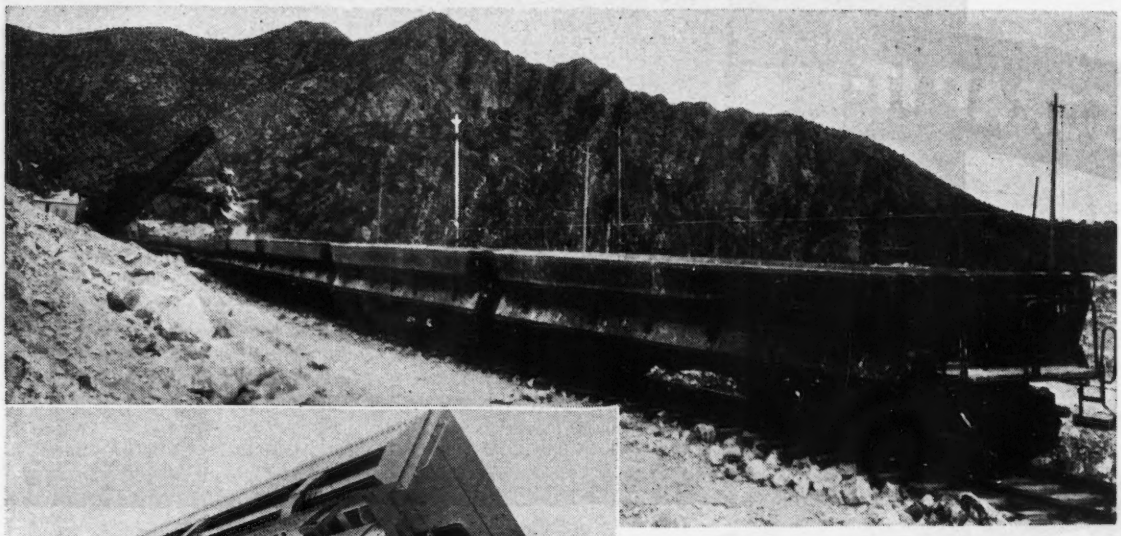
General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

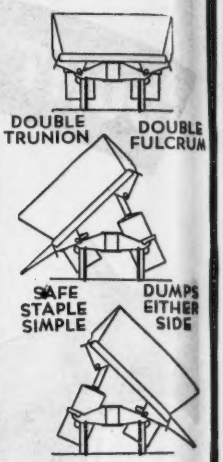
In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

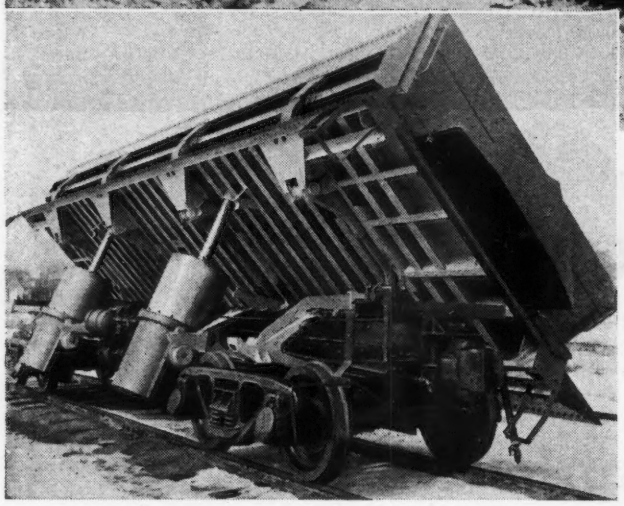
4402

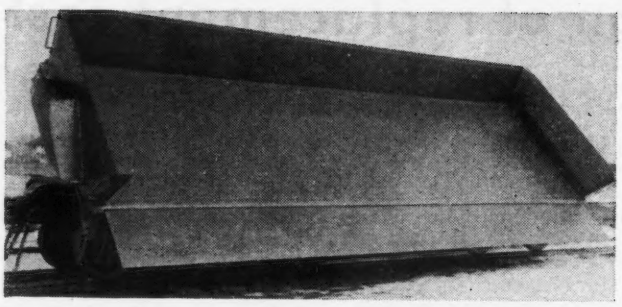
ANACONDA
from mine to consumer

Anaconda Bronze Welding Rods









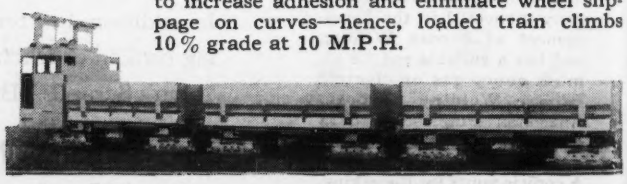
DIFFERENTIAL AIR DUMP CARS

(PATENTED)

Differential Air Dump Cars are constructed to withstand severe loading and dumping conditions. Powerful air cylinders assure quick and positive dumping to either side. The double fulcrum principal as shown in the diagram supports the dump body on widely spaced fulcrums and there is no rocking or swaying during transportation. Locking mechanism is eliminated and there is no chance for accidental dumping. Operation of side door is automatic and the load is deposited at an extreme distance from the track.

DIFFERENTIAL ELECTRIC TRAINS

Electric Trains with Differential 8-wheel AXLESS trucks have a high payload ratio and faster speeds. Differential AXLESS trucks reduce train resistance due to better alignment of wheels with rails and independent rotation of wheels. There is less flange, tread and rail wear. All wheels on each rail are geared together to increase adhesion and eliminate wheel slippage on curves—hence, loaded train climbs 10% grade at 10 M.P.H.

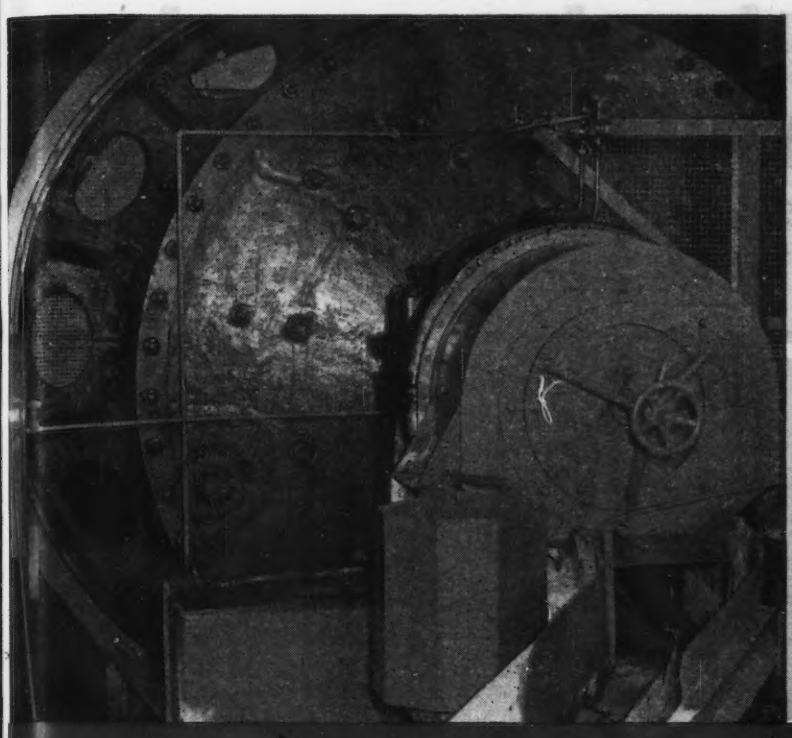


DIFFERENTIAL STEEL CAR COMPANY

FINDLAY, OHIO, U. S. A.

Builders of Haulage Equipment Since 1915

AIR DUMP CARS · MINE CARS · MINE LOCOMOTIVES · ROCK LARRIES · DUMPING DEVICES
BURDEN-BEARING LOCOMOTIVES · STOCKPILING CARS · COMPLETE HAULAGE SYSTEMS



Showing how Lorain Lining Plates, 2" thick, and lifting bars are assembled for use in the new Universal Atlas plant. Note that the lifting bar not only wedges between plates, but also clamps them down.

U·S·S Lorain Grinding Balls are especially made for the industry to the most exacting specifications of hardness and toughness. Use them to make better, more economical grinding doubly sure.

3 answers to your grinding needs

IF you were to write your own specifications for grinding mill plate lining you would undoubtedly insist on these features: quick, easy installation, long wearing life, economical maintenance, better grinding results.

That description fits Lorain Rolled Steel Plate Lining perfectly, for those were the features which led to its development. Today, hundreds of mills are reflecting its benefits on their cost sheets and production charts. Here are three of the many reasons why Lorain Rolled Steel Plate Lining increases efficiency and cuts costs:

1 The high strength and toughness of Rolled Steel Plate frequently makes possible the use of thinner linings. This means increased mill diameter, resulting in greater output.

2 Simplicity of design and ease of handling speed up installation. In large mills, as much as 96 man hours have been saved.

3 Rolled Steel Plate Linings not only wear longer than cast linings, but since Lorain Lifting Bars and Plates are both interchangeable and reversible, life is greatly increased, maintenance costs greatly reduced.

Lorain Rolled Steel Plate Lining is adaptable to your mills. It is available in any diameter or length and in whatever thickness best suits your operating conditions. It will produce better results more rapidly, more economically, no matter what sort of material you grind.

Our engineers will be glad to discuss Lorain Linings with you and to study your grinding problems, recommending the U·S·S Lorain Rolled Steel Plate Lining with Lifting Bars and Grinding Balls that will best suit your individual grinding equipment needs.

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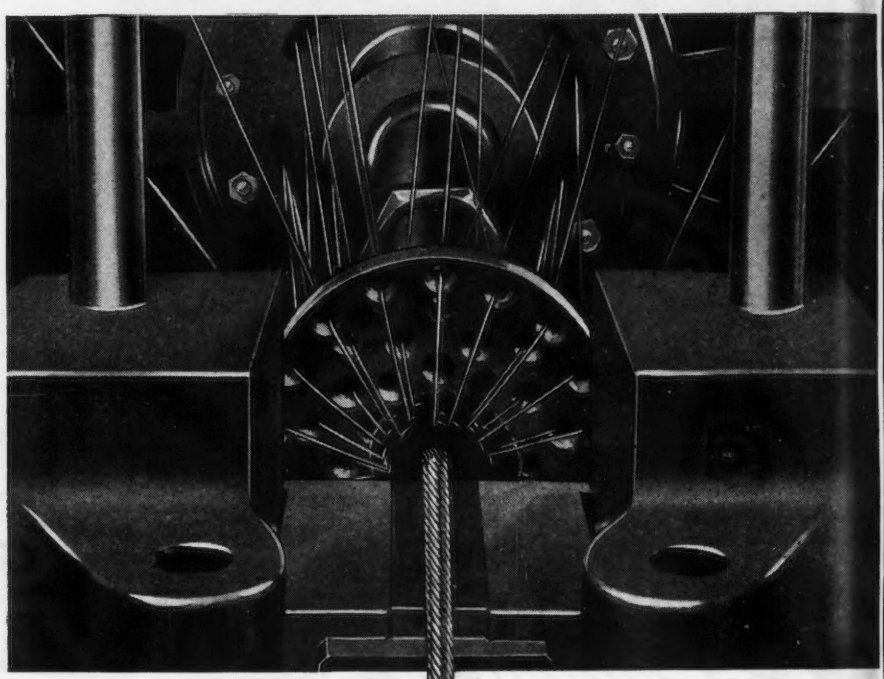
IT'S THE *internal lubrication* IN MACWHYTE PREformed WIRE ROPE

In Macwhyte PREformed Wire Rope, Internal Lubrication increases the life of the rope, thereby reducing operating costs.

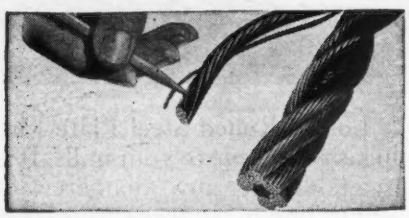
A special-formula lubricant made to Macwhyte specifications is force-fed to the wires as they are being closed into the strand.

Macwhyte Internal Lubricant improves the sliding action of the wires as they move in bending around sheaves and drums. In many cases the inside wires are in good condition after the outside wires are seriously worn.

Operators of equipment prefer Macwhyte PREformed Wire Rope because it operates so smoothly and spools on the drum so well.



The above illustration shows how internal lubrication is applied to Macwhyte PREformed ropes. *(Top of stranding die is removed.)* Note the wires pass through the lubricant which is pumped up from below and therefore each wire is completely covered and all spaces between the wires in the strand completely filled.



Macwhyte Wire Rope Lubricant is packed around each wire in all strands of Macwhyte Wire Rope.

If you have a service problem, Macwhyte Wire Rope engineers stand ready to give you the benefit of their experience in selecting the proper size, grade, and construction.

The demands of our armed services are so great now, there may be times when we cannot give you our usual prompt service and delivery. The situation changes from day to day so please keep trying to get Macwhyte Wire Rope. We'll serve you if we possibly can.

Rope Conservation Bulletins

18 illustrated articles on the use and care of Wire Rope have been bound into an 8½" x 11" book which is available free to Wire Rope users requesting it on their company letterhead. Ask for Bulletins No. 43-85.

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with larger holes wider spaced

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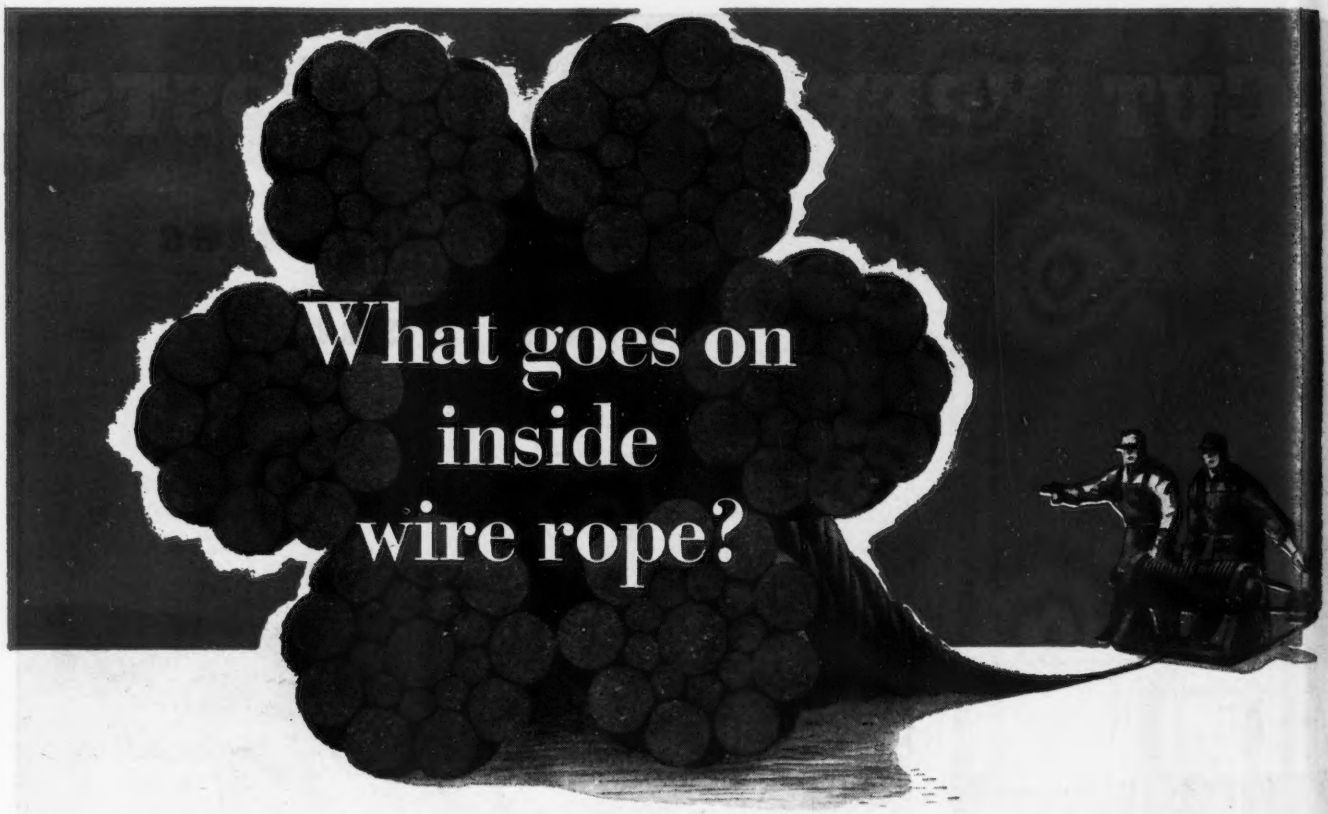
It takes a big, powerful drill like the 42-T to put down the large diameter holes. With its 46-foot derrick, its rigid construction, high speed drilling action, and fast sharp upstroke, the 42-T swings up to 6,000 pounds of tools . . . and puts down large diameter holes as rapidly as other machines drill 6 to 8-inch holes.

It's easy to take advantage of the increased tonnage and decreased drilling costs that come with larger holes. Write for details on the blast hole drilling economy that will be yours with the 42-T.

H-52C

SO. MILWAUKEE BUCYRUS ERIE WISCONSIN



The life of your wire rope depends on its core. Any strain on the rope causes the outer strands to squeeze in and slide over the center strands, and these absorb the shock. If these center strands are not kept well lubricated they soon become dry. When this happens, this sliding

action causes the wires to cut each other. Fine particles from the broken wires add to the friction and the rope rapidly loses its pliant strength and resistance to bending fatigue. This abrasion being internal, it is usually not noticed until the rope fails.

Just "grease" won't lubricate your wire rope! To get inside the rope demands a special lubricant such as Unacal Cable Lubricant.

Developed by Union Oil Company, Unacal Cable Lubricant is a tacky, fluid lubricant contained in a solvent which, on application, quickly penetrates to the core, carrying the lubricant with it. A reservoir of the lubricant is then formed *inside* the rope, oiling the wires and feeding lubricant to the rope as it works.

Unacal Cable Lubricant won't throw off. It resists replacement by dirt or grit. It contains a special corrosion inhibitor which protects the steel against rust and corrosion in the presence of fresh or salt water or corrosive liquids.

Unacal Cable Lubricant is easy to use and requires no heating. You can apply it by paintbrush, drip can or other suitable means.

Remember—wire rope lasts much longer, gives better and safer service when you keep it lubricated with Unacal Cable Lubricant. You can have a supply delivered by simply phoning your local Union Oil Company representative. Call him today and make sure of complete protection for your rope, or write Union Oil Company, 617 West 7th Street, Los Angeles 14, California.

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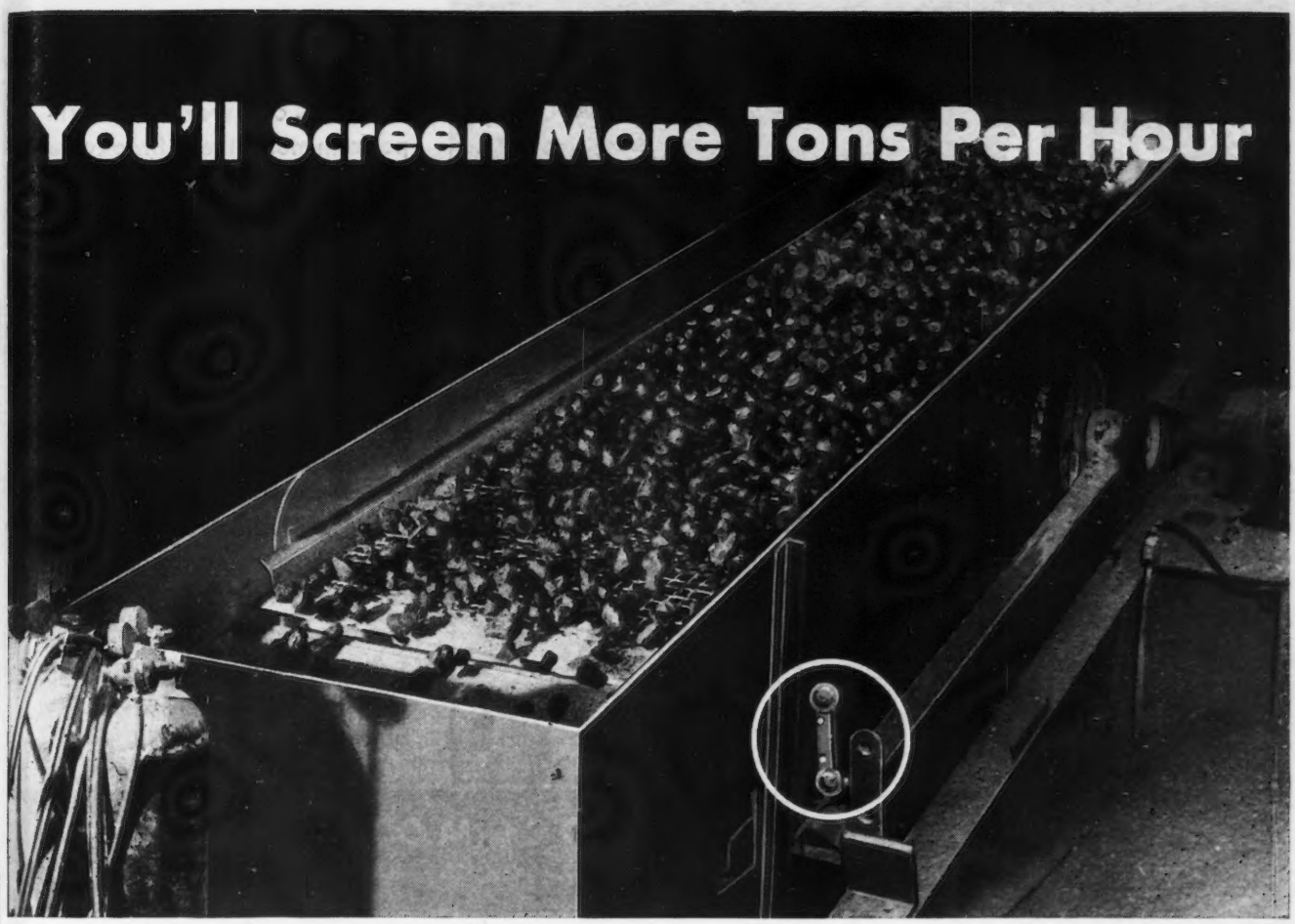

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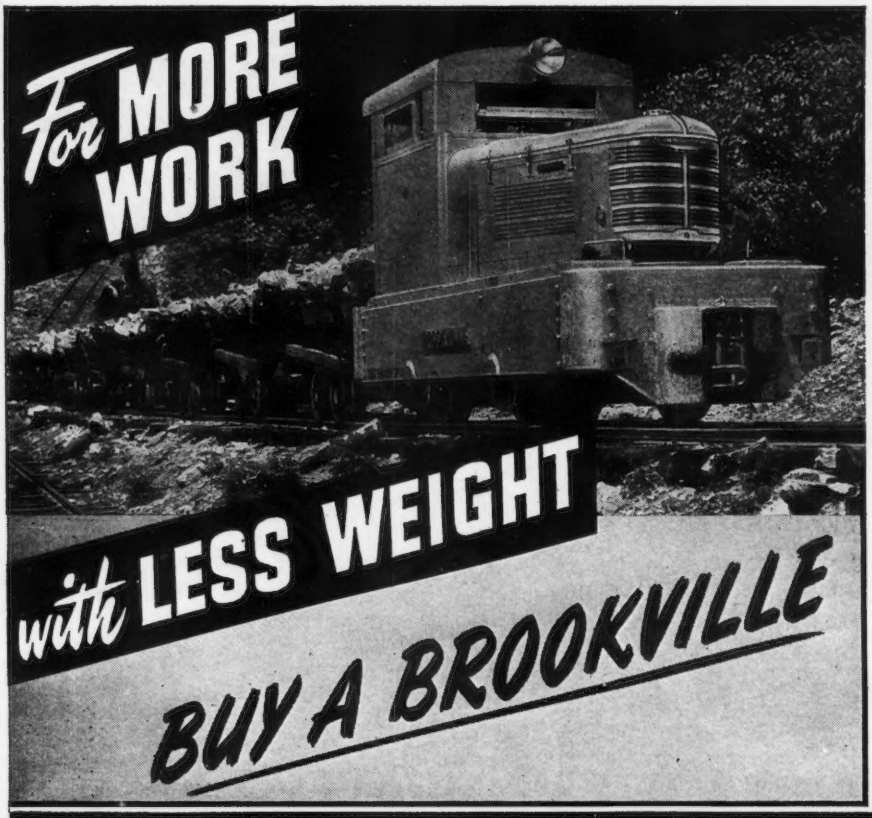

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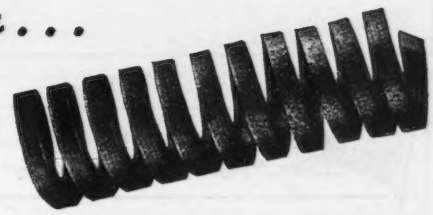

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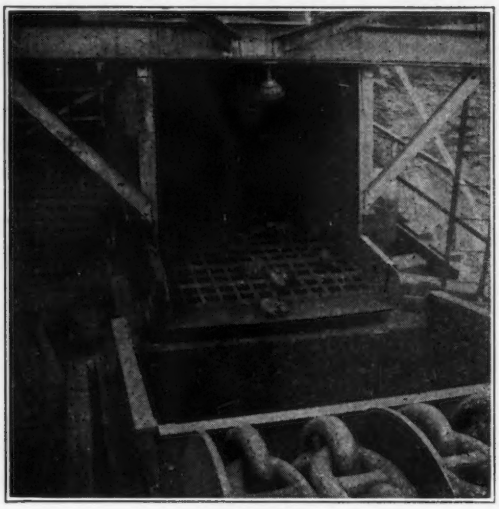

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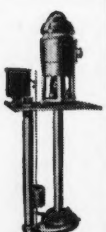
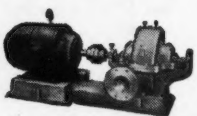
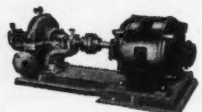


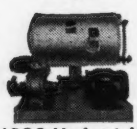
NSA Aurora Centrifugal Sump Pump



Type AD Hor. Split Case, Two Stage Centrifugal



Type OD Hor. Split-Case Double Suction Single Stage Centrifugal



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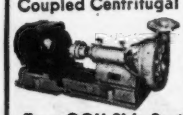
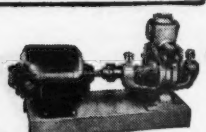


Type GGU Side Suction Single Stage Centrifugal



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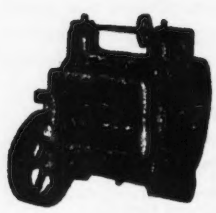

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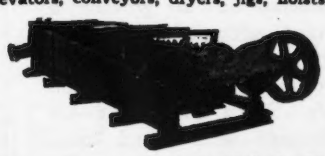

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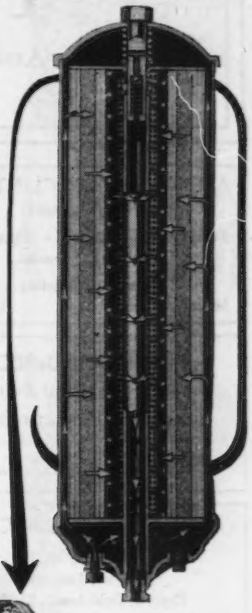

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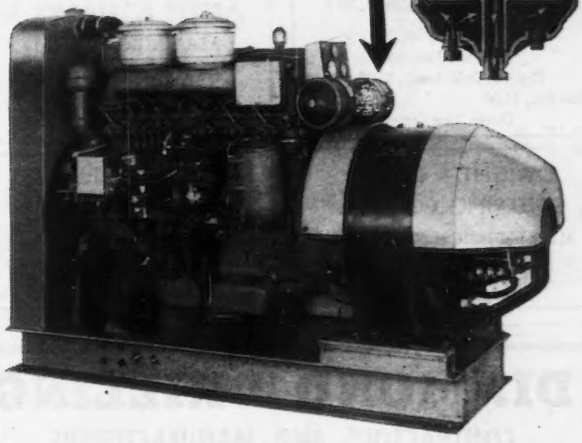

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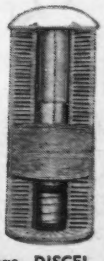

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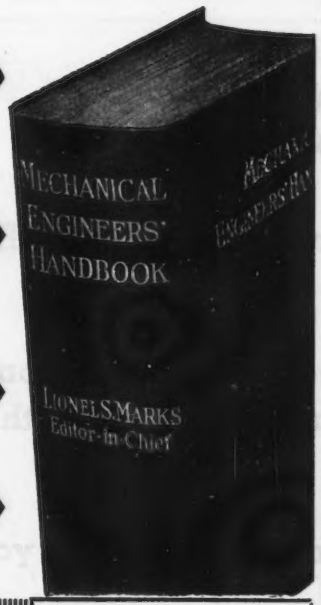

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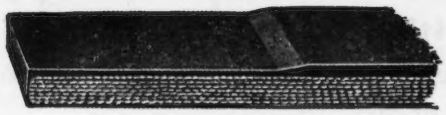

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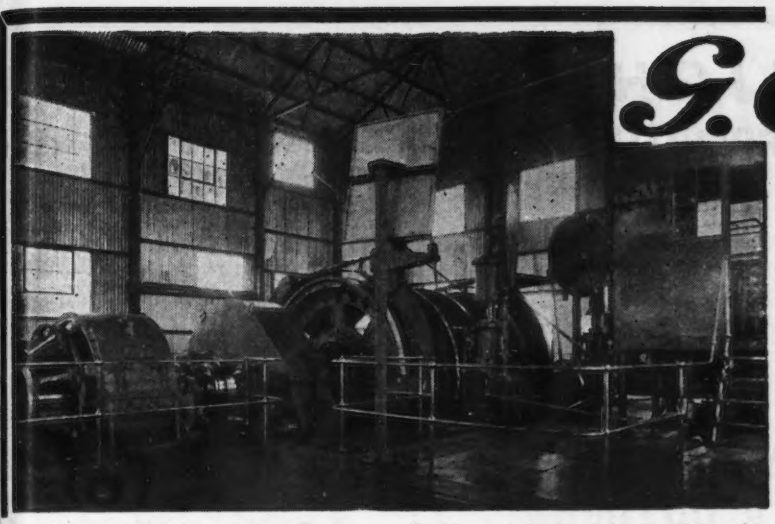

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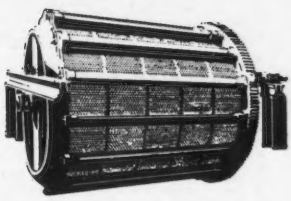

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DIVIDEND NO. 146

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ENGINEERING & MINING JOURNAL
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1—2½-Ton Jeffrey—Inside Wheels
1—3-Ton Whitcomb
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1—3½-Ton Jeffrey
2—5-Ton Mancha
1—7-Ton Mancha—"Hercules"
2—8-Ton Atlas

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1—3½-Ton Baldwin—500 Volts
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1—5'x16' C.I.W. Tube Mill
1—7'x6' Allis-Chalmers Ball Mill
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1—8'x36" Hardinge Ball Mill

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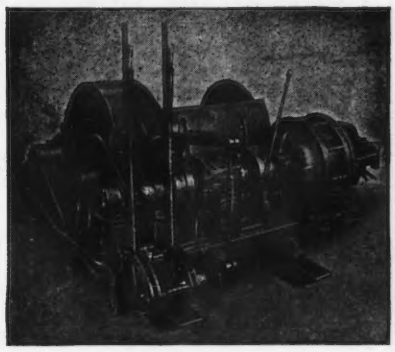
1—27"x14'8" Type "C" with 6' bowl
1—27"x15'6" Dorr, Model C
1—27"x18' Type "C" with 8' bowl
1—54"x18' Dorr, DSC Duplex
2—5½'x22½' Dorr, Model C-20
1—8' Dorr with bowl
1—8'x26½' Dorr, Model D



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1— 30-HP Double Drum—English Iron Works
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1—100-HP Single Drum—H & B
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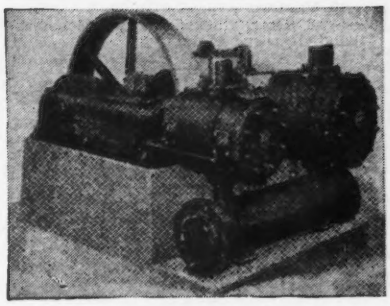
1—16' Dia. x 6 Hearth Herreshoff Roaster Complete with downtake and stack.



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1—2½" Pacific, 6-Stage
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1—3" Hill, 3-Stage
1—3" Worthington, 2-Stage
2—3" United, 5-Stage
5—3" United, 6-Stage
2—3" Union, 6-Stage
1—4" Platt Iron Works, 2-Stage
1—5" Cameron 4-Stage
1—5" Cameron 6-Stage
1—5" Fairbanks-Morse, 2-Stage
2—6" Manistee, 8-Stage
1—6" Dayton-Dowd, 2-Stage
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1—40' Dorr Thickener with Superstructure
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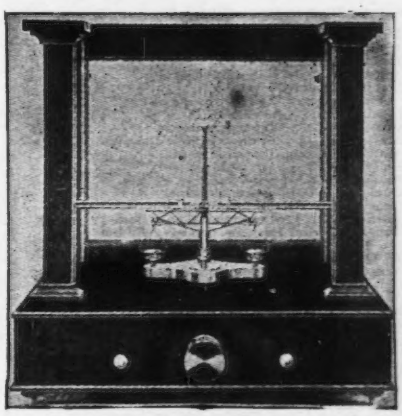

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1—Type "B" Ainsworth, 1/50 mg. sensibility
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1—16" Merrick Conveyor Weightometer
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7—No. 6 Wilfley Concentrating Tables, Steel underframe, Enclosed motion
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1—9"x16" Universal Jaw Crusher
1—8"x18" Universal Jaw Crusher
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1—18'x8' Dorr Thickener with Mechanism and Gearhead Motor
1—100 KVA Westinghouse Syn. Motor, 3 Ph. 60 Cy. 2200 Volts, 937 RPM
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Link Belt Model K480 Diesel dragline 2 yds.
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Ohio Loco. Crane 22½ tons, Electric
Marion 371, 1¼ yard Shovel-Crane-Dragline
Marion 37 Steam Shovel, 1¼ yards
Buc. Erie 42B, 1½ yd. steam shovel
Buc. Erie 43B, 1½ yard Dragline, 60' bm.
Buc. Erie 2½ yard Steam Dragline
General ¾ yd. Diesel Crane
Koehring 301, ¾ yd., gas shovel and Crane
Buc. Erie Steam Dragline, 6–8 yds. 175' bm.
Int. TD 18 tractor with angledozer
D7 Cat. tractor with trailbuilder
Allis Chalmers L.O. Tractor with bulldozer
Ind. Brownhoist Crane, gas, 40' bm., 1 yd.
Allis Chalmers K Tractor with bulldozer
Int. T35 Tractor with Angledozer
Jaw Crushers: 12x26, 13x30, 14x28, 16x32, 24x36
Gyratory Crusher, Superior-McCully 30"
Gyratory Crusher, Traylor Type "T" 12
Gyratory Crusher, Allis Chalmers, Model 12K
Allis Chalmers 10" Cent. Pump 3500 GPM, elec.
American 45 & 50 ton Saddle Tank Switcher
Vulcan 30 ton Saddle Tank Locomotive
Mack 30 ton Diesel-Electric, std. ga. Locomotive
Whitcomb 14 ton, 36" gauge, Diesel Loco.
Vulcan 6 ton, 36" gauge, gas Locomotive
15—Gondola Cars, 50 tons, steel Pumps—Gas, Electric, Steam—large stock.
National 100 H.P., double drum Dragline Hoist
Lidgerwood 100 HP double drum gas Hoist
Flory 100 HP single drum Shaft Hoist, AC
Lidgerwood 80 HP double drum Elec. Hoist, AC
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I.R. 1050 CFM., 2 stage Compressor, gas drive
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Erie ¾ yd. Clam, rehandling Bucket
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4, Dump, Western, Automatic, 20-Yd., 40 & 50 Ton.
1, Dump, Koppel, Drop-Door, 20-Yd., 40-Ton
18, Dump, K & J, Automatic, 16-Yd., 40-Ton
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4—6 ton Goodman, 36 Ga.
5—8 ton Baldwin Westgh., 36 Ga.

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5—6 ton Baldwin Westgh., 36 Ga. Comb.
4—4 ton Goodman 42 Ga.—3 Goodman 36 Ga.
3—8 ton Goodman 36 Ga.
4—6 ton Baldwin-Westgh., 42 Ga.
3—8 ton & 10 ton G E., 42 Ga.
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5—70 Ton Std. Ga.

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8 Ton Plymouth Std. Ga. Gas.

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6 Yd. Bucyrus 200 B Stripper Shovel
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1 Yd. Lorain Mode 57 Elec. Shovel
3—Gardner Denver GD9H
3—Eimco Findley Model 12B & 21
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1 Sullivan HL3 Car Loader

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5 In., 6 In., 8 In. 20 In. Traylor
28 In. Traylor TY

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COARSE JAW CRUSHERS
5x10, 6x12, 7x9, 7x10, 10x12, 9x16, 9x18, 10x20, 12x18, 12x20, 12x22, 12x24, 12x26, 14x24, 13x10, 15x30, 15x36, 18x32, 18x36, 24x36, 30x36, 36x48, 42x48, 56x84, 60x84

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42"	5	1/8"	1/16"
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30"	6	1/8"	1/16"
30"	5	1/8"	1/16"
24"	5	1/8"	1/32"
24"	4	1/8"	1/32"
20"	5	1/8"	1/32"
20"	4	1/8"	1/32"
18"	4	1/8"	1/32"
16"	4	1/8"	1/32"
14"	4	1/16"	1/32"
12"	4	1/16"	1/32"

Inquire For Prices - Mention Size and Lengths

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16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
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	35 "	10.50
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1½"	50 "	15.00
	25 "	10.00
	35 "	14.00
	50 "	20.00

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	50 "	10.00	1.50 "
¾"	25 "	6.25	2.50 "
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1"	25 "	10.00	3.50 "
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Tube & Ball mills—6' x 9'—5' x 22'—5½' x 22'—6' x 22'—5' x 4'.
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New Dryers & Kilns built for all purposes

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ALPHABETICAL INDEX TO ADVERTISERS

***Where an asterisk precedes manufacturer's name, more detailed information may be found in the *1944-45 edition of The Mining Catalogs*, the combined catalogs of manufacturers of mining, milling, smelting and refining equipment.**

Acker Drill Co. 140
Allied Steel Products Inc. 150
*Allen-Sherman-Hoff Co. Second Cover
Allis Chalmers. 12, 13
Allis-Chalmers (Traction Div.). 46
*American Brattice Cloth Corp. 144
American Brass Co. 193
American Cable Div. of American Chain & Cable Co. 3rd cover
American Manganese Steel Div. American Brake Shoe & Fdry Co. 127
American Rubber Mfg. Co. 206
Anaconda Copper Mining Co. 193
*Atlas Car & Mfg. Co. 160
Aurora Pump Co. 202

Baker Mfg. Co. 171
Barber-Greene Co. 184
Barrett Co. 204
*Bethlehem Steel Co. 177
*Bird Machine Co. 4
Birdsboro Steel Fdry & Machine Co. 179
Booth Engineers. 204
Boston Woven Hose & Rubber Co. 23
*Boyles Bros. Drilling Co. 203
Braun Corporation. 148
Briggs Clarifier Co. 203
Brookville Locomotive Co. 200
Bucyrus-Erie Co. 197
*Bullard Co. E. D. 132

Carboloy Co. 125
Carborundum Co. (Refractories Div.). 163
*Card Iron Works Co. C. S. 152
*Carnegie Illinois Steel Corp. 195
Carver Pump Co. 123
Caterpillar Tractor Co. 167
*Chicago Pneumatic Tool Co. 14, 145
*Cleveland Rock Drill Co. 67
Climax Molybdenum Co. 213
*Colorado Iron Works Co. 32
*Complete Machinery & Mfg. Co. Inc. 152
Continental Gin Co. 149
*Coppus Engineering Corp. 161
Crane Co. 155
Cummins Engine Co. Inc. 181

Davenport Locomotive Works. 142
*Deister Concentrator Co. 124
*Deister Machine Co. 144
*Denver Equipment Co. 63
*Denver Fire Clay Co. 137
Differential Steel Car Co. 194
Dixie Machinery Mfg. Co. 135
*Dorr Co. 7
Dresser Industries Inc. 24, 25
*DuPont de Nemours & Co. Inc. E. I. (Fabrikoid Div.). 153

*Eagle Iron Works. 133
*Edison Storage Battery Div. of Thos. A. Edison Inc. 48
*Eimco Corporation. 8, 9
*Electric Storage Battery Co. 113
Electro Metallurgical Co. 170
*Ensign-Bickford Co. 151
Euclid Road Machinery Co. 168
Eutectic Welding Alloys Co. 165

*Filter Media Corp. 136
Fraser & Chalmers Eng. Works. 207

*Galigher Co. 22
Galland-Henning Mfg. Co. 126
*Gardner-Denver Co. 26, 27
Garlock Packing Co. 201
Gates Rubber Co. 36
General Chemical Co. 31
General Electric (Appliance and Merchandise Dept.). 131
Goodall Rubber Co. Inc. 138
*Goodman Mfg. Co. 17
Goodrich Co. B.F. 214
Goodyear Tire & Rubber Co. 15
Gould Storage Battery Corp. 164
Great Western Div. of Dow Chemical. 159
Gruendler Crusher & Pulverizer Co. 202
Guyan Machinery Co. 146

Hamer Oil Tool Co. 185
Hardinge Co. Inc. 156
Harnischfeger Corp. 191
Hazard Insulated Wire Works. 37
Hazard Wire Rope Div. American Chain & Cable Co. 20, 21
Hendrick Mfg. Co. 204
Hendy Iron Works, Joshua. 57
Holmes & Bro. Inc. Robt. 190
Hose Accessories Co. 157

Independent Pneumatic Tool Co. 42, 43
*Ingersoll-Rand Co. 3, 29
International Nickel Co. 55
I-T-E Circuit Breaker Co. 140

*Jeffrey Manufacturing Co. 120
Joliette Steel Ltd. 47

*Kennedy-Van Saun Mfg. & Engr. Corp. 34
*Knox Mfg. Co. 154
Koehler Mfg. Co. 172
Koehring Co. 66

Lake Shore Engineering Co. 174
LaPlant-Choate Mfg. Co. Inc. 166
*Laughlin Co. Thos. 154
LeTourneau Inc. R. G. 49
Lima Locomotive Works Inc. 18
Lister-Blackstone. 207
Linn Manufacturing Corp. 141
*Longyear Co. E. J. 44

Mack Trucks Inc. 192
MacMillan Petroleum Corp. 183
Macwhyte Co. 196
Marion Steam Shovel Co. 175
McGraw-Hill Book Co. 201, 205
McKee & Co. Arthur G. 117
McLanahan & Stone Corp. 202
Medart Co. 180
*Merrick Scale Mfg. Co. 148
Midvale Co. 188
*Mine & Smelter Supply Co. 68
Mine Safety Appliances Co. 119
*Morse Bros. Machinery Co. 16

New Haven Vibrator Co. 142
*Newport Industries Inc. 200
New York Engineering Co. 200
*Nichols Engineering & Research Corp. 186
*Nordberg Mfg. Co. 19
Northern Blower Co. 141
Northwest Engineering Co. 45

Ohio Brass Co. 58

Pan-American Engrg. Co. 130
*Pennsylvania Crusher Co. 207
Philco Storage Battery Co. Insert between pages 50 and 55
Philipp Bros. Inc. 146
*Pressed Steel Car Co. Inc. 143

Railway Express Agency (Air Express Div.) 122
*Roebling's Sons Co. John A. 38
Rollway Bearing Co. 176
Roots-Connersville Blower Corp. 143
Ryerson & Sons Inc. Jos. T. 139

*Sauerman Bros. 139
Schaffer Poidometer Corp. 150
*Schramm Inc. 121
Screen Equipment Co. 199
Searchlight Section. 208, 211
Separations Engrg. Corp. 156
SKF Industries Inc. 178
Sharples Chemical Inc. 162
Shriver & Co. T. Inc. 152
Simplicity Engineering Co. 202
Smit & Co. Inc. Anton. 205
*Smit & Sons Inc. J. K. 206
Smith Engineering Works. 50
Smith & Co. Inc. Gordon. 134
Socony-Vacuum Oil Co. Inc. 169
Sorel Steel Foundries Ltd. 202
*Sprague & Henwood Inc. 204
Standard Oil Co. Cal. 189
Stearns Magnetic Mfg. Co. 150
*Stephens Adamson Mfg. Co. 39
Stoody Co. 59
*Straub Mfg. Co. 28
Sturtevant Mill Co. 129
Sutton, Steele & Steel Inc. 156
Sullivan Machinery Co. 64, 65

Taylor Forge & Pipe Works. 62
Texas Co. 10, 11
Timken Roller Bearing Co. 61, Fourth Cover
*Traylor Engrg. & Mfg. Co. 5

Ultra Violet Products Inc. 203
*Union Carbide & Carbon Corp. 170
Union Oil Co. 198
Upson Walton Co. 56
United States Rubber Co. 173
*U. S. Steel Subsidiaries. 195

Victaulic Co. of America. 35
Vulcan Iron Works. 33

Walter Motor Truck Co. 147
Walworth Co. 60
Western Machinery Co. 6
Western Precipitation Co. 182
*Westinghouse Elec. & Mfg. Co. 41
Wheel Trueing Tool Co. 30
*Wilfley & Sons Co. Inc. A. R. 70
Willson Products Inc. 128
Wood Shovel & Tool Co. 115
*Worthington Pump & Mchry Corp. 187

Yuba Manufacturing Co. 40

■

PROFESSIONAL SERVICES. 204

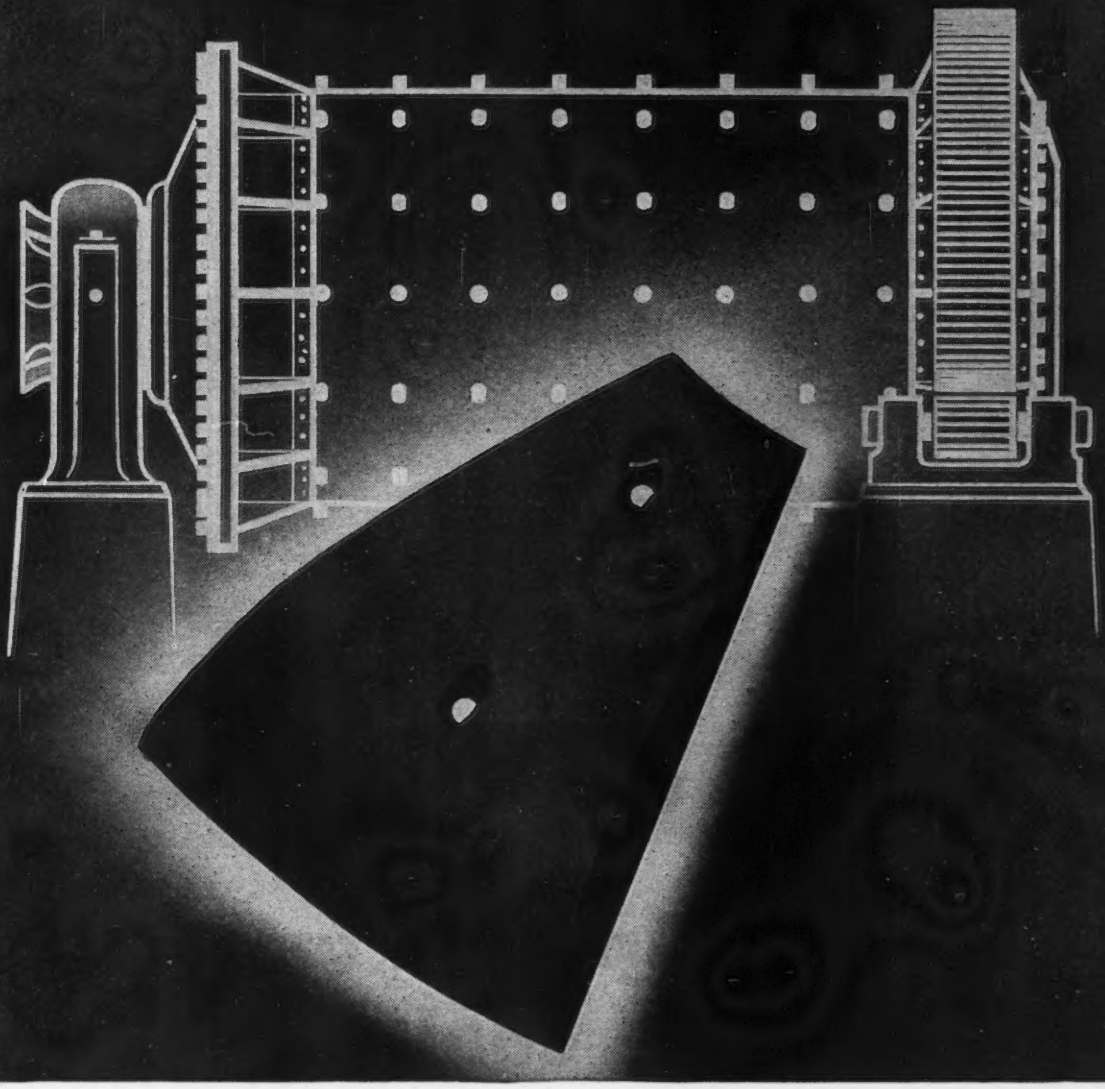
■

SEARCHLIGHT SECTION

Classified Advertising

BUSINESS OPPORTUNITIES. 208
CORE DRILLING. 208
Pennsylvania Drilling Co. 208
Dividend Notice. 208
MINES FOR SALE. 208
POSITIONS VACANT. 208
POSITIONS WANTED. 208
PROPERTY FOR SALE. 208
USED EQUIPMENT. 208–211
Carlyle Rubber Co. 211
Dulien Steel Products Inc. 210
Emsco Equipment Co. 210
Florence Machinery & Supply Co. 210
Greensburg Machine Co. 210
Greenspon's Son Pipe Corp. 211
Havlick, J. L. 211
Heineken, W. P. 211
Hilcrest Lumber Co. Inc. 208
Hyman-Michaels Co. 210
Iron & Steel Products Inc. 210
Morse Bros. Machinery Co. 209
Peerless Oil & Gas Co. 211
Stanhope, Inc., R. C. 211
Walsh Co., Richard P. 210
Weiss Co., B. M. 210

Molybdenum cast steel mill liners outwear Hadfield manganese steel. We have the proof.



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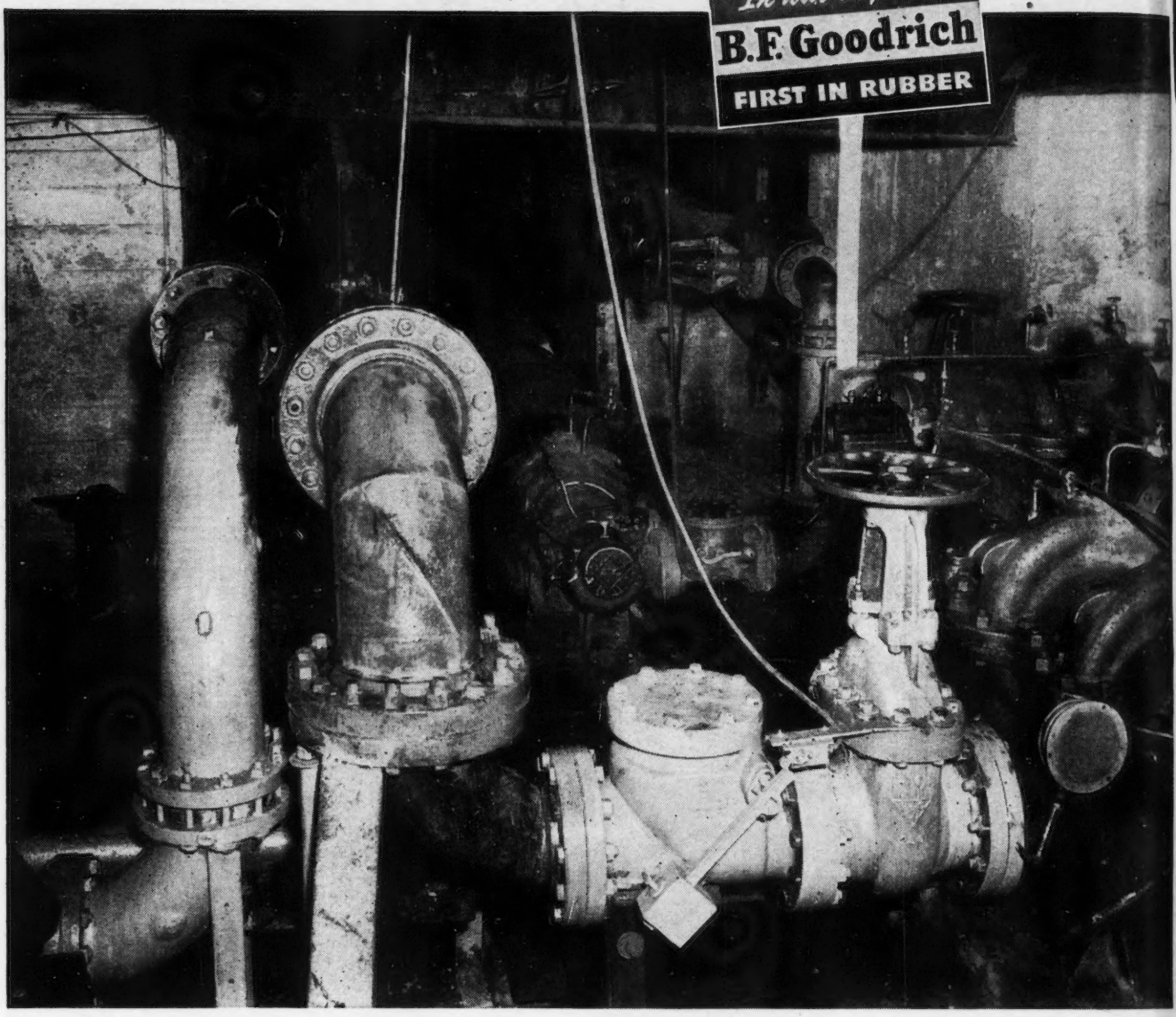

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RUBBER *and* SYNTHETIC *products*

FOOTWALL "HEEBIE JEEBIES"

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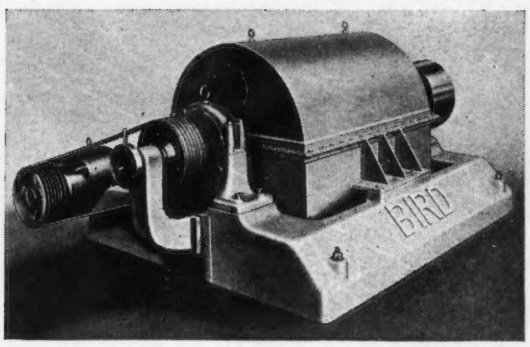
Ingersoll-Rand

SLIME DOES NOT PAY!

This BIRD Nabs the Slime Before It Gets Sent to a Cell



You can deslime your cell feeds at "floating consistency" without chemical dispersion.

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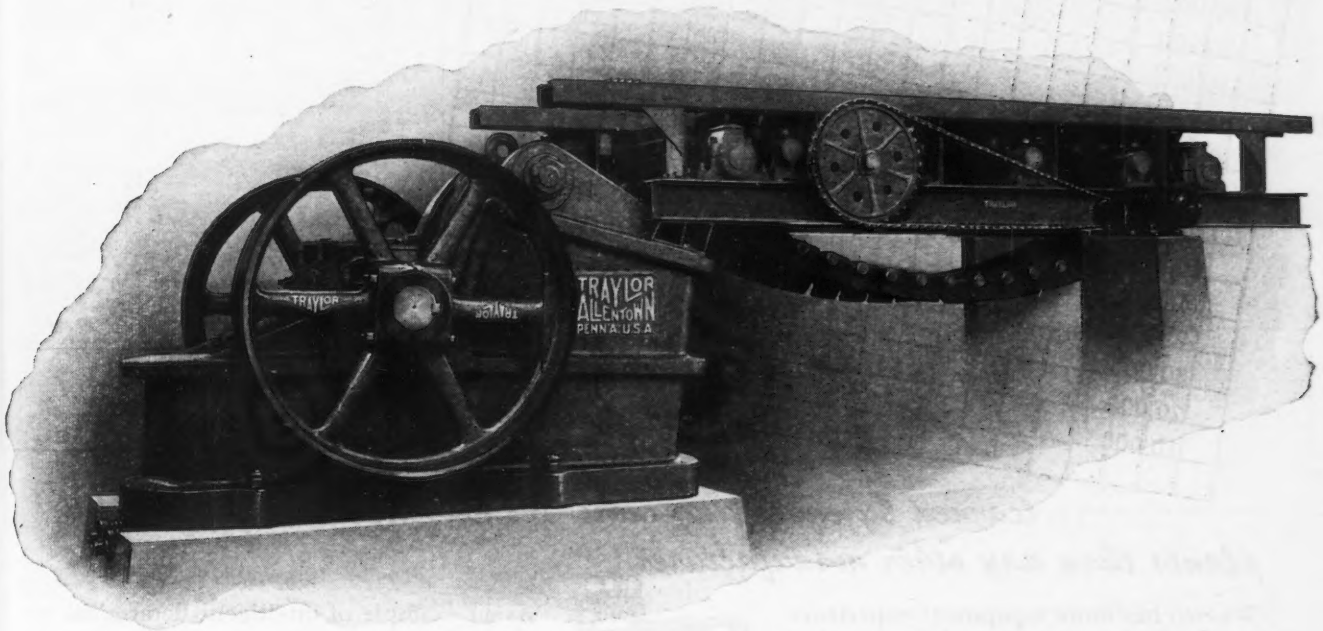
BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS

BUILDERS OF BIRD CONTINUOUS CENTRIFUGAL FILTERS

ENGINEERING AND MINING JOURNAL, December, 1944. Vol. 145, No. 12. Publication Office:210 East York St. York, Pa. Editorial and Executive Offices: 330 W. 42nd Street, New York, 18, N. Y. Return Postage Guaranteed. Subscription rates: United States and possessions $3 a year, $4 for 2 years, $5 for 3 years. Canada $3.50 a year, $6 for 3 years. Other countries in the Americas outside the United States and Canada, $4 a year, $6 for 2 years, $8 for 3 years. Great Britain and British possessions, 30s a year, 60s for three years. Elsewhere $5 a year, $10 for three years. Price of this issue 50c, or 3s. Entered as Second Class Matter, August 1, 1944, at Post Office at York, Pa., under the Act of March 3, 1879. Printed in the United States.

TRAYLOR APRON FEEDER *and* JAW CRUSHER

A fine combination for efficient operation



WE BUILD

Kilns
Coolers
Dryers
Slakers
Scrubbers
Jaw Crushers
Gyratory Crushers
Reduction Crushers
Crushing Rolls
Ball Mills
Rod Mills
Wash Mills
Feeders

A Jaw Crusher fed with an Apron Feeder will increase capacity up to 40% by eliminating bridging and supplying a steady even feed.

Photo shows shop assembly of a 24″ x 36″ Traylor Type M Jaw Crusher and a 36″ x 12′-0″ Traylor All-Steel Heavy Duty Apron Feeder.

The Type M Crusher is built with a 50,000 pound TENSILE STRENGTH Meehanite Frame, with pitman shaft bearings fitted with removable water-cooled babbitted bushings; Cast Steel Swing Jaw and Pitman; patented Swing Jaw Suspension fitted with removable bushings with greatly increased bearing area; and Manganese steel patented smooth face Curved Jaw Plates, which increase life of wearing plates up to 100% over Straight Crushing Plates and allow for finer settings.

Write us for appointment to talk over this Crusher and Feeder Combination with you.

TRAYLOR
ENGINEERING & MANUFACTURING CO.
MAIN OFFICE AND WORKS — ALLENTOWN, PENNA., U.S.A.

NEW YORK CITY 3416 Empire State Bldg.
CHICAGO 2051 One La Salle St. Bldg.
SALT LAKE CITY 101 West Second South St.
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SPOKANE S. 2707 Rhyolite Rd.

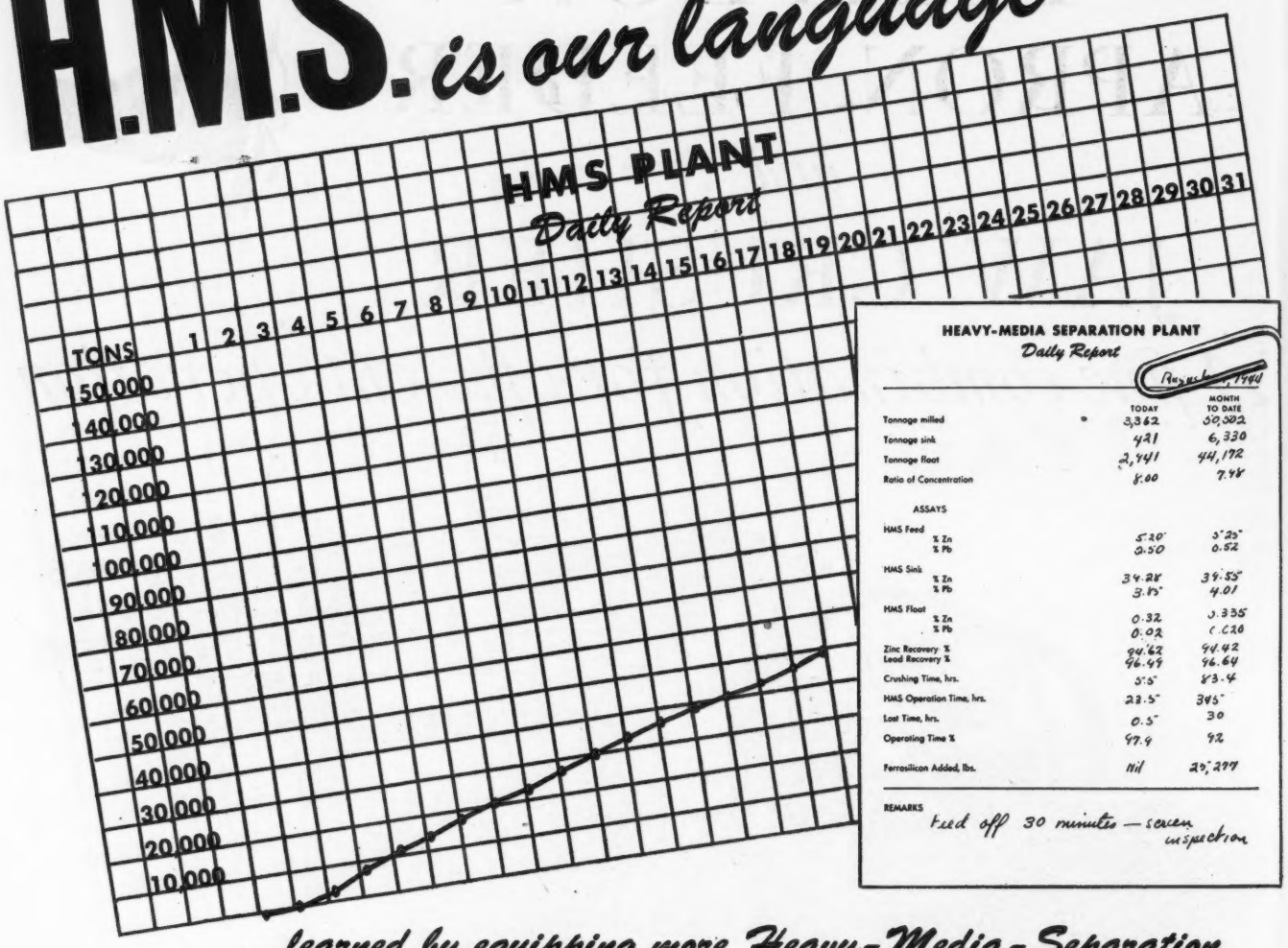
Agency for British Columbia — B. C. EQUIPMENT CO., LTD. 551 Howe St., Vancouver, B. C.

Australian Manufacturers Traylor Reduction Crushers — JACQUES BROS. PTY., LTD. Richmond, Victoria, Aus.

Export Department—104 Pearl St., New York City.

Foreign Sales Agencies; London, Lima, Rio de Janero, Buenos Aires, Santiago, Antofagasta Oruro, La Paz, Montevideo

H.M.S. *is our language*

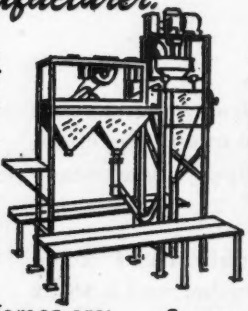


HEAVY-MEDIA SEPARATION PLANT
Daily Report

	TODAY	MONTH TO DATE
Tonnage milled	3,362	50,302
Tonnage sink	421	6,330
Tonnage float	2,941	44,172
Ratio of Concentration	8.00	7.48
ASSAYS		
HMS Feed % Zn	5.20	5.25
HMS Feed % Pb	0.50	0.52
HMS Sink % Zn	34.28	39.55
HMS Sink % Pb	3.15	4.01
HMS Float % Zn	0.32	0.335
HMS Float % Pb	0.02	0.020
Zinc Recovery %	94.62	94.42
Lead Recovery %	96.49	96.64
Crushing Time, hrs.	5.5	83.4
HMS Operation Time, hrs.	23.5	345
Lost Time, hrs.	0.5	30
Operating Time %	97.9	92
Ferrosilicon Added, lbs.	Nil	29,277

REMARKS: Feed off 30 minutes — screen inspection

...learned by equipping more Heavy-Media-Separation plants than any other manufacturer.



Wemco has more equipment experience to offer in the comparatively new field of Heavy-Media-Separation than any other manufacturer. Through solving the machinery problems of many of the HMS plants now in operation, Wemco engineers have accumulated a vast store of operating data in a field in which few have any experience.

Among the HMS plants equipped by Wemco are: *Western Fluorspar Corporation, Rosiclare Lead & Fluorspar Mining Co., Ore and Chemical Corporation, International Minerals & Chemical Corp., Northwest Magnesite Company, Lone Star Steel Company, and the Cleveland Cliffs Iron Mining Co.*

As an example of intelligent determination of equipment needs, Wemco has available an HMS Laboratory Unit for batch testing or for continuous testing up to 500 pounds per hour. Test results can be readily projected into full-scale plant designs.

HMS equipment manufactured by Wemco includes:

- Separatory Screws
- Separatory Cones
- Densifiers
- Special Thickeners
- Magnetizing Blocks
- Glandless Sand Pumps
- Solenoid Gates
- Special Media Separating Hoppers
- 20" HMS Laboratory Unit

672

If you are going HMS use Wemco

WEMCO

WESTERN MACHINERY COMPANY

760 FOLSOM STREET, SAN FRANCISCO, 7, CALIFORNIA

LOS ANGELES • SACRAMENTO • SPOKANE • SALT LAKE CITY • PHOENIX • DENVER • NEW YORK • WASHINGTON, D.C.

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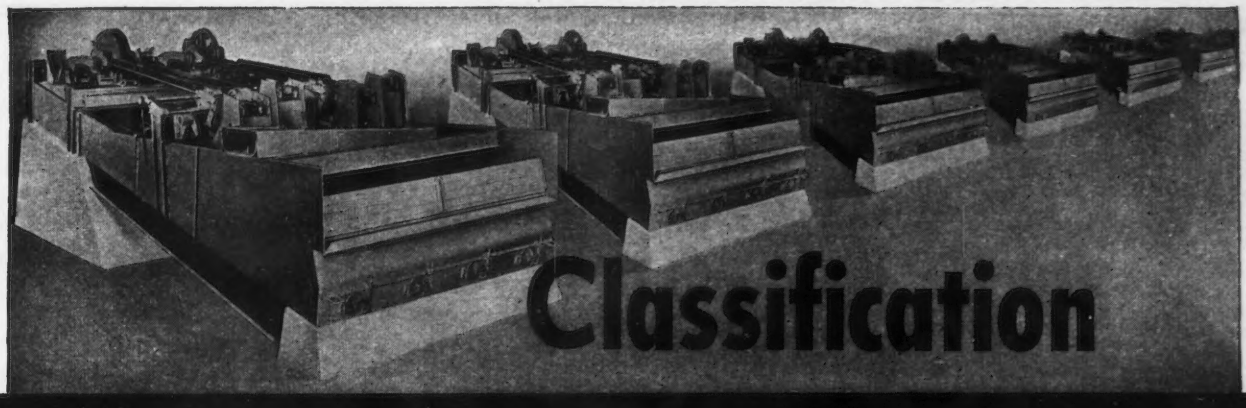
FEEDERS • CLASSIFIERS
CENTRIFUGAL PUMPS
HYDROSEPARATORS
• • • THICKENERS • • •



Let's Talk Facts not claims on what Dilution means in Classifier results!

• Efficient classification requires a pulp pool where free settling is possible . . . for in a thick pulp, entrained fines will be carried along with the sands and some oversize will overflow the weir.

Here are competitive results from a large concentrator that prove the point. Two classifiers working on the same job and the same ore . . . but at different dilutions.

	WEIR LENGTH	TONS PER 24 HRS.	% SOLIDS	MESH SEPARATION	UNDERSIZE IN SANDS
Dorr FX Classifier	8′	1302	43.2	1.5% +28M 44.9% −200M	54.5% −28M 4.9% −200M
Another Unit	7′ 8″	1308	50.0	4.3% +28M 47.2% −200M	71.7% −28M 9.2% −200M

• Why the great difference in results? Simply, because the Dorr is operating at 43% solids which constitutes a free settling pool on this heavy lead-zinc ore . . . while the other unit must run with a much thicker pulp, which carries more oversize material over the weir; and at the opposite end, allows undersize sulphide particles to be returned to the ball mill. This results in wasteful overgrinding and tailings losses. Furthermore the proper preparation of flotation feed in the above example made it possible to recover extra metal to the value of $22,000 per year per machine.

Why not feed the other unit more water? It can't be done . . . for due to the lack of agitation in its "quiescent pool," more water will cause oversettling. Key to the difference is the Effective Agitation provided by the rake action of the Dorr . . . a rake action that pays off with better metallurgical results!

The coupon sent to our nearest office will bring a Dorr engineer to analyze your problem.

THE DORR COMPANY
(Nearest Office)

Please send an engineer to discuss Effective Agitation and Dilution in ore classification—no obligation of course.

*Name*_____

*Street Address*_____

*City*_____

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RESEARCH · ENGINEERING · EQUIPMENT

ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

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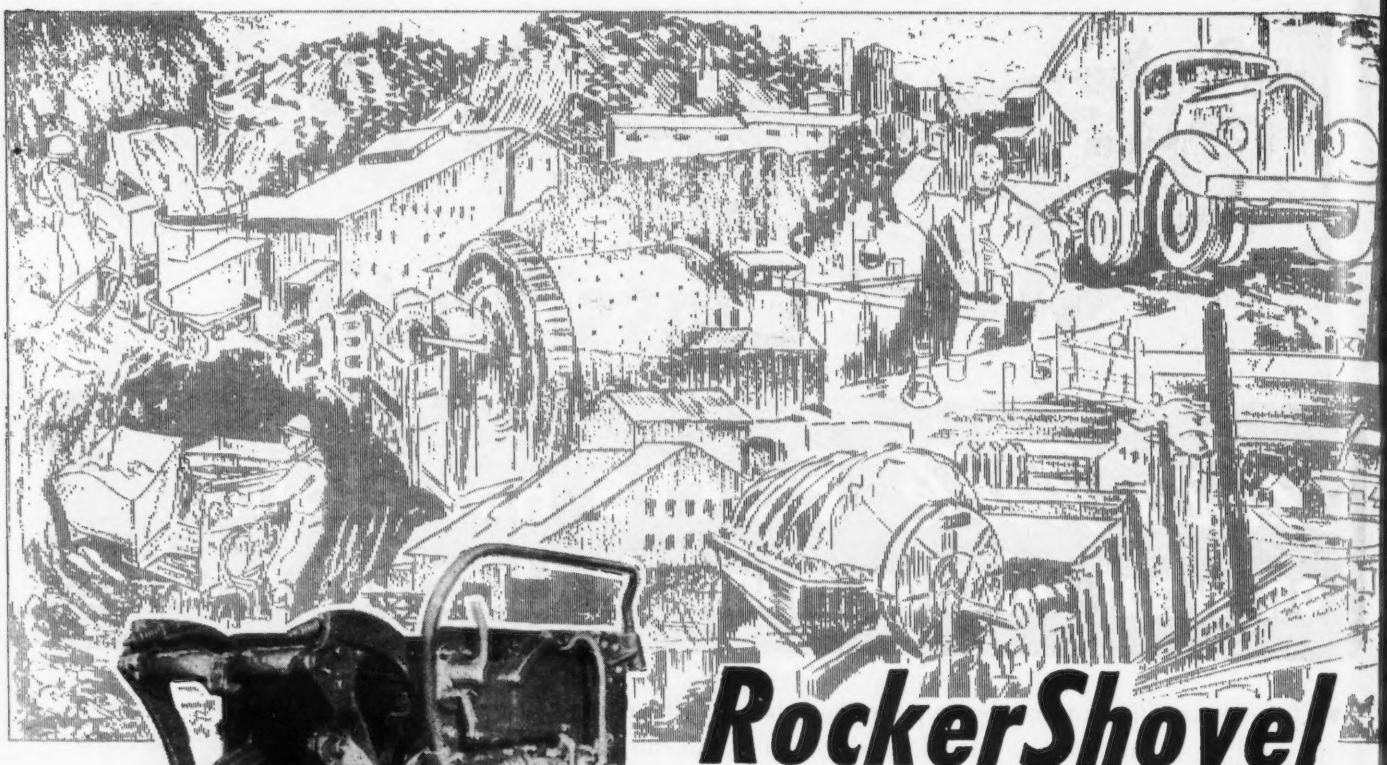
CHICAGO 1, ILL. . . . . 221 NO. LA SALLE ST.
DENVER 2, COLO. . . . . COOPER BUILDING
LOS ANGELES 14, CAL. . . . 811 WEST 7TH ST.

RESEARCH AND TESTING LABORATORIES
WESTPORT, CONN.

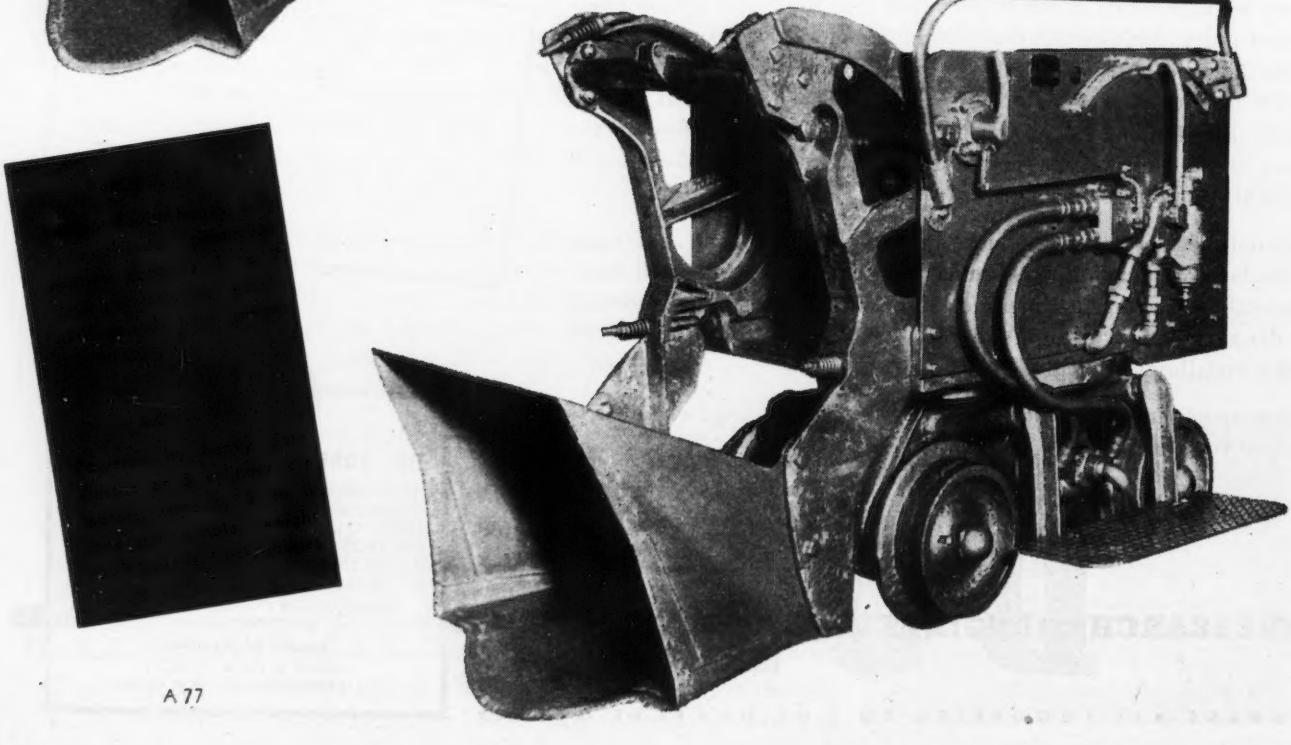
SUGAR PROCESSING
PETREE & DORR DIVISION
570 LEXINGTON AVE., NEW YORK 22



RockerShovel
for the Post-War

After the Victory parades, after the tumult and the shouting, the world will look to peace and reconstruction. Exhausted natural resources will have to be replaced; cities and towns rebuilt, the work of men and machines will be needed to restore the things ravaged by war. Eimco offers its Parade of Rocker Shovels as a contribution to that purpose. Mechanical loading of materials on the surface and underground will speed the return to normal and for every job an Eimco RockerShovel is available.

Eimco RockerShovels by the thousand have worked



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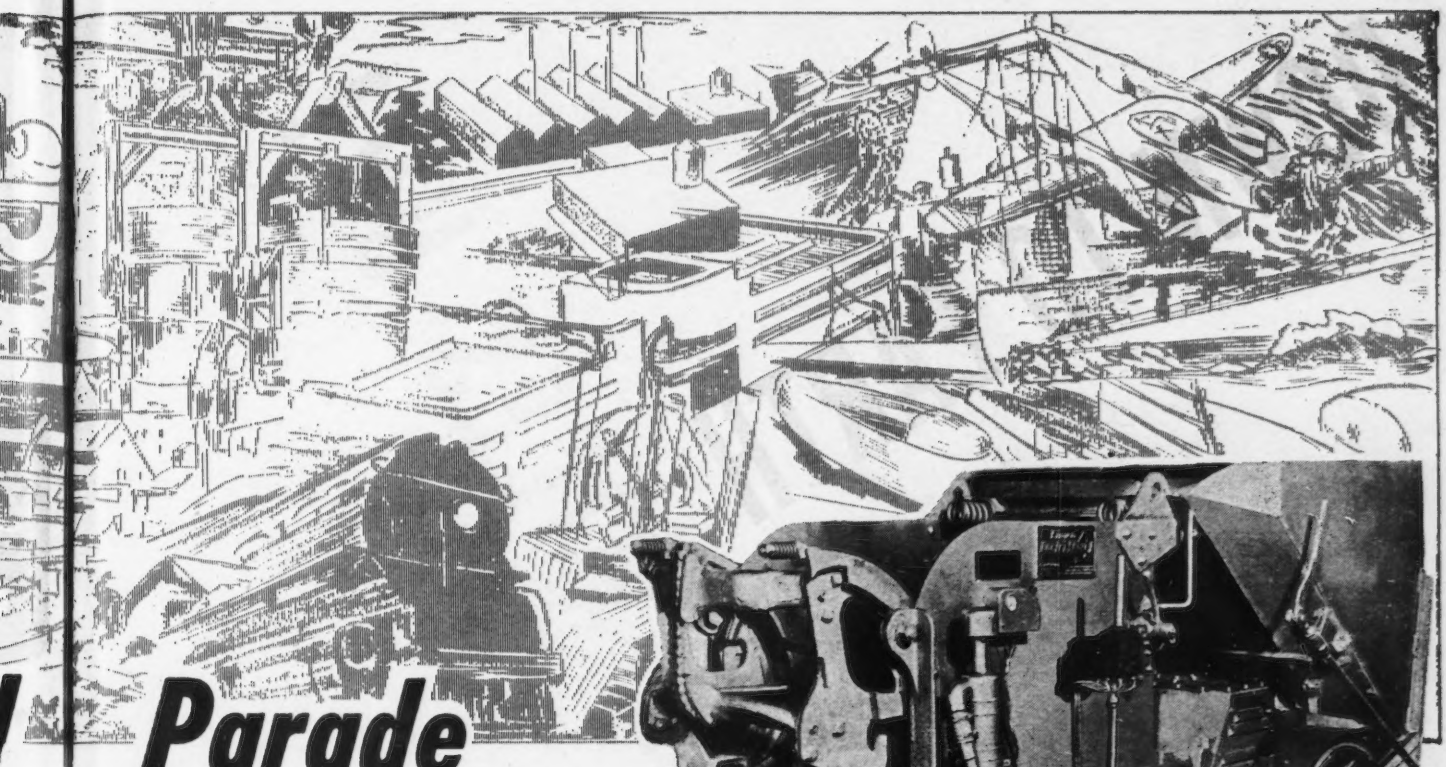


Parade

World

night and day in all parts of the world to bring Victory through production and in the post-war period RockerShovels will continue to operate at maximum capacity with low cost maintenance. Eimco service engineers will again give to users the full benefit of their world-wide experience. Eimco's designing engineers will add new features and improvements to retain for Eimco its leadership in mechanical loading.

EIMCO

THE EIMCO CORPORATION

Executive Offices and Factories Salt Lake City 8, Utah

Branches: New York, Chicago, El Paso, Sacramento, St. Louis

DOWN TO EARTH 2 MILES UP!

MODERN mining and quarrying requirements make it necessary to use air compressors and tools in all kinds of places and in all kinds of weather . . . as witness this jackhammer operator drilling above the portal of a mine 11,200 feet up on the side of a mountain.

In snow and frost 2 miles up — or in hot pits below sea level, air compressors run more efficiently, require fewer overhauls and repairs, when lubricated *effectively.* And to experienced operators everywhere, this means — Texaco.

Texaco Alcaid, Algol or *Ursa Oils,* for example, assure wide-opening, tight-closing valves, free piston rings, open ports, clear lines, continuous air supply. They also assure maximum service life between overhauls, fewer repairs and replacements. Their use in air compressors is world wide.

Because of the benefits it delivers —

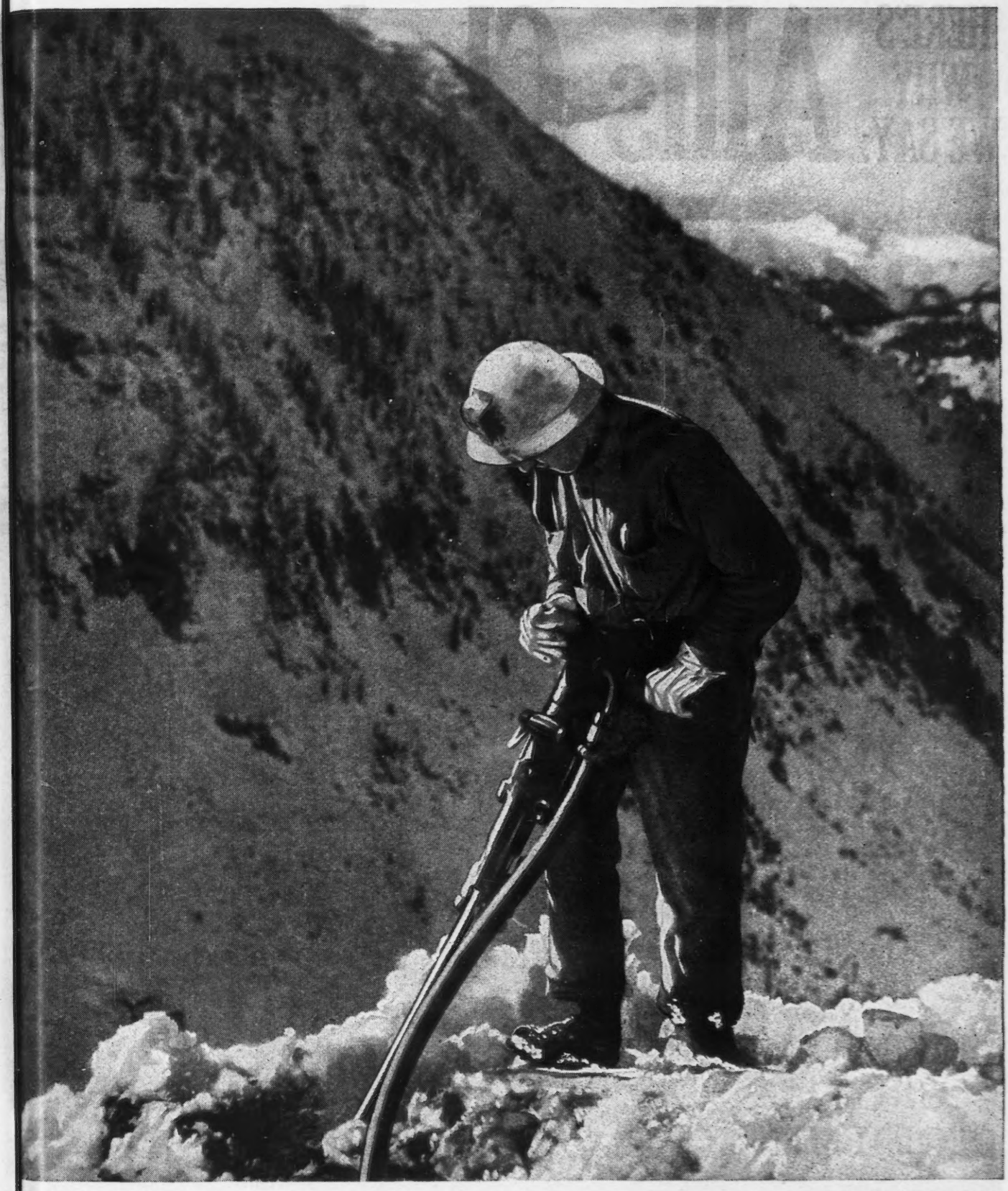
More copper mining equipment in the U. S. is lubricated with Texaco than with any other brand.

Texaco Lubrication Engineering Service is available to you through more than 2300 Texaco distributing points in the 48 States. The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS



Lubricants and Fuels

FOR THE MINING INDUSTRY

★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

HERE'S WHY WE SAY: Allis-Chalmers are Unbiased...

CRUSHERS	Jaw Crushers	Superior Type All-Steel Blake Type "B" Blake All-Steel Fine Reduction Dodge
	Gyratory Crushers	Superior Type Type "R" Reduction Newhouse
	Roll Crushers	Double Crushing Rolls Fairmount Single Roll
	Hammer Crushers	Pulverators (Impact Type)
WASHING & DISINTE-GRATING	Screens	Revolving—Heavy Duty Rotary Scrubber Wet Vibrating Screens with or without Scrubber Pockets
	Blade Mills	Up to 12" Feed
	Revolving Scrubbers	Up to 6" Feed
	Log Washers	Up to 3½" Feed
	Screw Washers	Up to ½" Feed
	Slug Mills	Grind Out Soft Materials
HYDRO-METAL-LURGICAL EQUIPMENT	Concentration	Classifiers Jigs Filters Agitators
	Cyanidation	Distributors Tanks Classifiers Agitators Filters

ALLIS-CHALMERS

of Basic Processing Equipment — Recommends

Recommendations

A GLANCE AT THE "BREAKDOWN" below gives you a rough idea of the broad range of equipment A-C builds for crushing, cement and mining industries. This "breakdown" is not complete, for A-C builds over 1600 *different* products — many of them widely used in these industries.

The significant fact is that A-C builds *all types* of basic processing equipment . . . many different styles and sizes. When you need a crusher, for example, selection can be made—not from one—but *four different* types. This means you get the *exact* equipment for your application. Yes, A-C recommendations *are* unbiased . . . because they're based on the job to be done—not an improvised way of doing it!

Next time *you* have a processing problem call on A-C. ALLIS-CHALMERS, MILWAUKEE 1, WIS.

A 1739-A

GRINDERS	Single-Stage	Rod Mills Ball, Ballpeb & Pebble Mills
	Multi-Stage	Compeb (1, 2, 3 or 4 Stage) Ballpeb (Fine Grinding Only)
VIBRATING SCREENS	Coarse Materials	Style "C" Style "B", Centrifugal Low Head, Horizontal Ripl-Flo
	Light & Fine	Aero-Vibe Electro-Magnetic Laboratory Low Head Gyratory Sifters
HANDLING	Conveyors	Pan, Apron, Spiral Elevators Electro-Magnetic
	Feeders	Rotary, Ferris-Wheel, Cantilever Grizzly, Cone, Swing, Table Types Electro-Magnetic Pan, Apron, Spiral
PYRO-PROCESSING	Hoists	Electric Friction
	Rotary Kilns	Portland Cement, Lime, Lime Sludge, Alumina, Magnesia, Ore Concentrates
	Dryers, Roasters	Multiple & Flat Hearth Furnaces Blast & Reverberatory Furnaces Rotary Dryers Nordyke Rotary Steam Dryers
	Coolers (Heat Recuperating)	Air Quenching Direct Rotary Indirect Rotary Tube Type Rotary

BUILDS ALL TYPES

the Exact Type Suited to Your Particular Needs!

For FAST, Low-Cost Drilling, CP-60 MOTORdrifter

FOR drilling in hard, seamy or ravelly formations, for tunneling from Jumbo drill carriages—there is no better drifter than the CP-60 MOTORdrifter. It will do a fast, low-cost drilling job anywhere.

The CP Motorfeed is powered by the compact and dependable rotary type motor. Its sensitive control enables the operator to maintain correct position for maximum drilling and quick reverse for changing steel. Write for further details or arrange for a demonstration of the CP-60 MOTORdrifter under your own conditions. You will like its drilling speed, low air consumption, low maintenance, easy handling.

There are three models of fast-drilling CP MOTOR-drifters: the 3" CP-50, the 3½" CP-60, and the 4" CP-70. There is a parallel line of CP Hand-Feed Drifters.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

BEST FOR ROCK WORK

HEAVY-DUTY FEATURES of the Goodyear HARD ROCK LUG TIRE

1. Massive lug-bar tread
2. Extra-thick undertread
3. Tread-armored sidewalls
4. Super-strong Rayotwist cord carcass

YES, this husky Goodyear Hard Rock Lug tire gives top performance wherever the haul is heavy over tire-cutting, tire-snagging, tire-bruising ground.

That's true because this great tire, proved by years of experience, is specially designed for rock work—is armor-built throughout. It's armored with heavy beads, with extra-heavy undertread, and with massive, wide-based lugs that grip and guard, extending deep down over the sidewalls to *tread-armor* them against cuts and bruises!

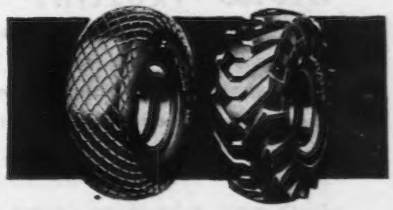
And today this brawny work tire is stronger than ever because it is built with Rayotwist cord—Goodyear's patented rayon cord—the *strongest cord we have ever used in a work tire.*

Goodyear design provides that universal, two-way tread—no rights, no lefts—with the same powerful grip reverse or forward.

It's a *self-cleaning* tread, with straight, wide, V-shaped grooves open at the ends and so pitched that dirt and stones are forced out as the tire turns!

It all adds up to increased job stamina, so it's no wonder that cost-conscious contractors make Goodyear Hard Rock Lugs first choice wherever the going is toughest and roughest.

THERE'S A GOODYEAR FOR EVERY JOB



For drawn dirt-movers specify Goodyear All-Weather Earth-Mover

For traction in soft going specify Goodyear Sure-Grip

BUY WAR BONDS ★ BUY FOR KEEPS

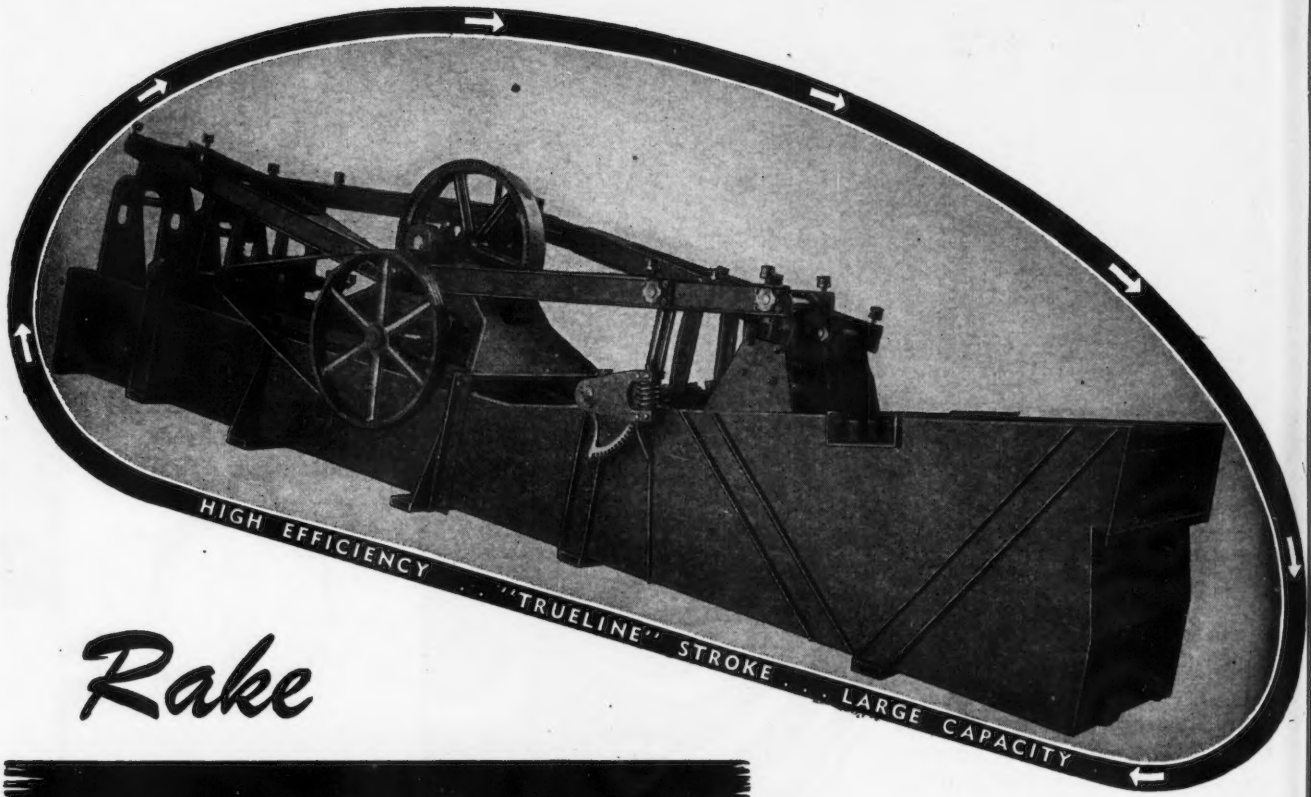
GOODYEAR

THE GREATEST NAME IN RUBBER

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Rayotwist, Sure-Grip, All-Weather—T.M.'s The Goodyear Tire & Rubber Company

MORSE "TRUELINE"



Rake CLASSIFIERS

***Morse* "TRUELINE" CLASSIFIERS** are mechanically correct, metallurgically efficient and operate with low maintenance. The mechanisms are compact, simple to maintain and give smooth mechanical performance during continuous operation.

Only minimum head room requirements are necessary. All "Trueline" classifiers have machine-cut tooth gears, rake lifting devices and a comparatively few moving parts to grease. Simplex and duplex styles are identical in principle and vary in width from the 18-inch simplex up to 8-foot duplex. Rake strokes vary from 8-inch to 16-inch in length, depending on the size of the classifier and the duty to be performed.

The exclusive Morse "Trueline" mechanism imparts long straight line rake strokes that produce the highest sand raking capacities. All "Trueline" classifiers have large pool areas to give consistant and uniform efficiency of the classifier overflow. Sturdy fabricated mechanisms and heavy reinforced steel tanks contribute to the successful mechanical performance of these outstanding classifiers.

Write for Bulletin 437

MORSE BROS. MACHINERY CO.

ESTABLISHED 1898

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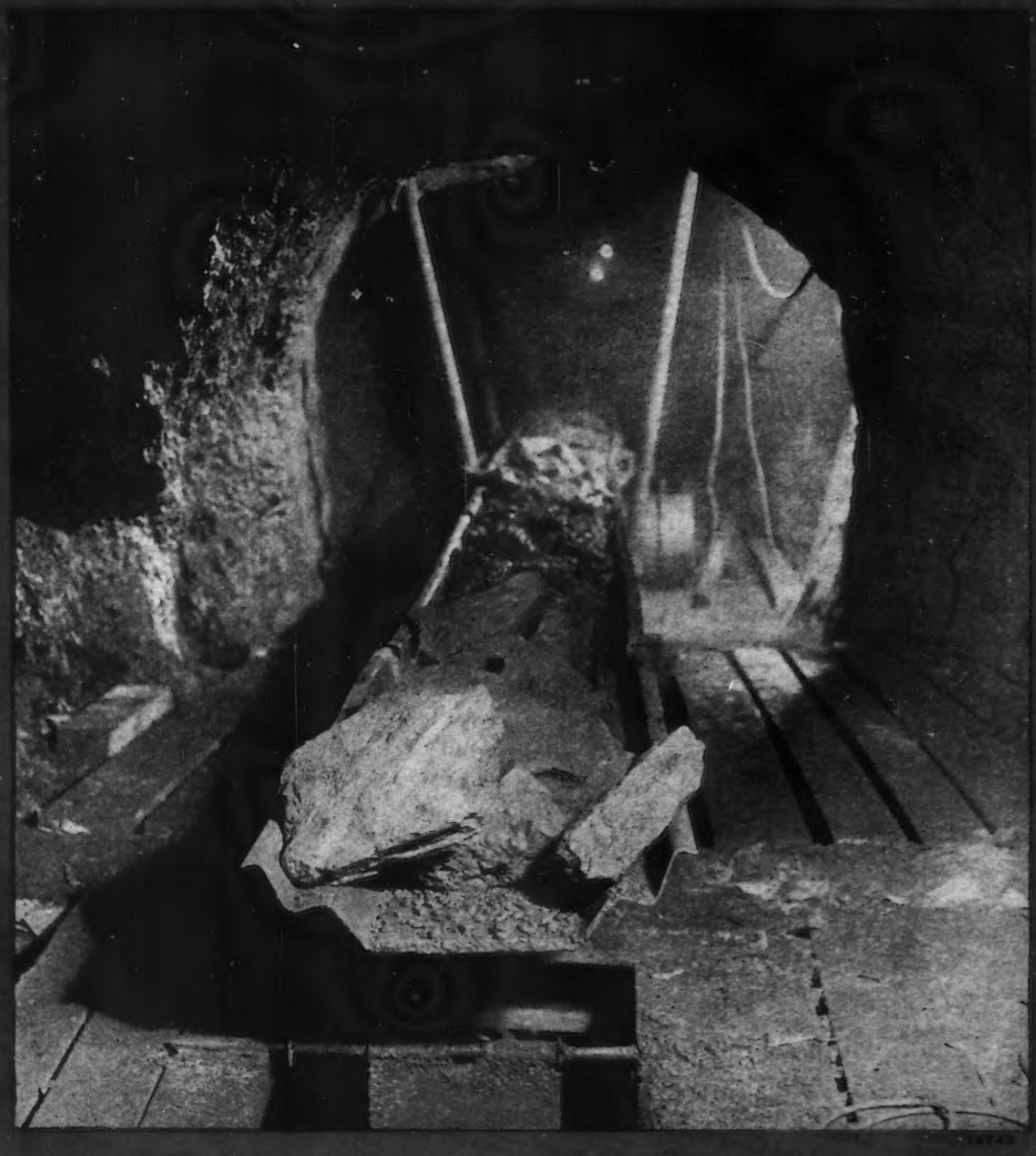
A Fast, Low Cost Way to Move Your Ore



GOODMAN SHAKER CONVEYORS

- assure a constant, even flow of ore—wet or dry, fine or coarse.
- conserve manpower.
- reduce deadwork.
- have an exceptionally low maintenance cost.

ARMY E NAVY

GOODMAN MANUFACTURING COMPANY

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A name to remember when buying a Shovel, Dragline or Crane

LIMA

LIMA Cranes, Shovels and Draglines are not the achievement of a day - - they are the result of constant improvement and advancement in design and construction over a long period.

Every shovel, crane or dragline - - large or small - - that bears the LIMA trade-name is a quality machine that in design, performance and efficiency gives the greatest value for your investment.

It is true that most of our production is going to the armed forces, but the day is coming when you will be placing orders for new equipment. When that day comes remember the name LIMA. The Crane, Shovel or Dragline that gets things done quicker, safer and more economically.

Write for Free Bulletin Today.

LIMA LOCOMOTIVE WORKS, INCORPORATED

Shovel and Crane Division - - LIMA, OHIO

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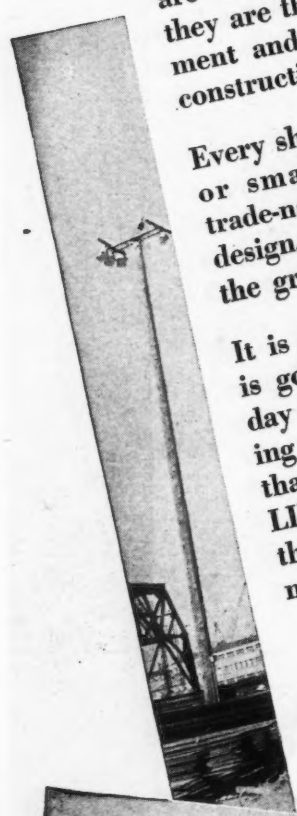
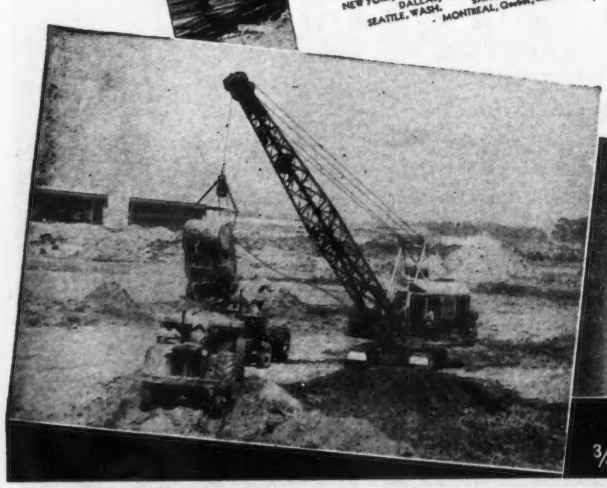
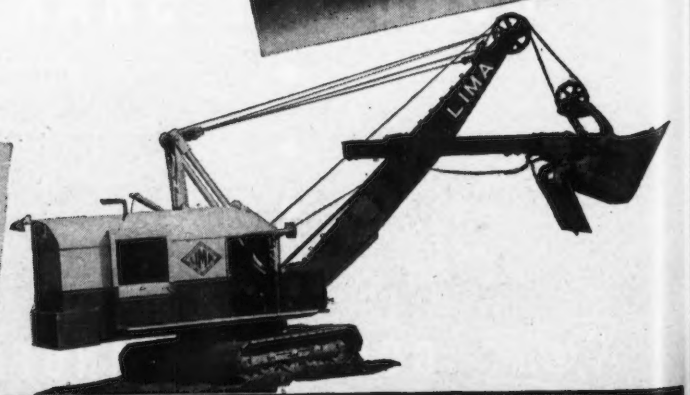
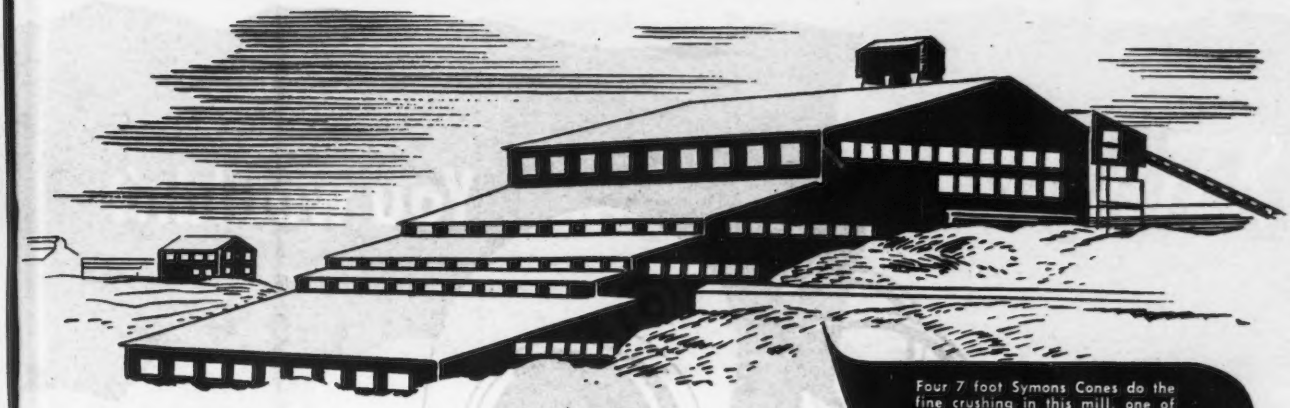
SEATTLE, WASH. SAN FRANCISCO, CALIF LOS ANGELES, CALIF. SPOKANE, WASH.
MONTREAL, Quebec, Can. VANCOUVER, B. C.







SHOVELS ¾ Yd. to 3½ Yd. | CRANES 13 Tons to 65 Tons | DRAGLINES VARIABLE



Four 7 foot Symons Cones do the fine crushing in this mill, one of the larger producing lead and zinc.

Leading Producers of Lead and Zinc use SYMONS CONES

Africa

Rhodesia Broken Hill Development Company, Ltd.

Australia

Lake George Mines, Ltd.
Mount Isa Mines, Ltd.
North Broken Hill Mines, Ltd.
Zinc Corporation, Ltd.

Canada

Consolidated M. & S. Co., Ltd.
Hudson Bay M. & S. Co., Ltd.
Buchans Mining Co.

Mexico

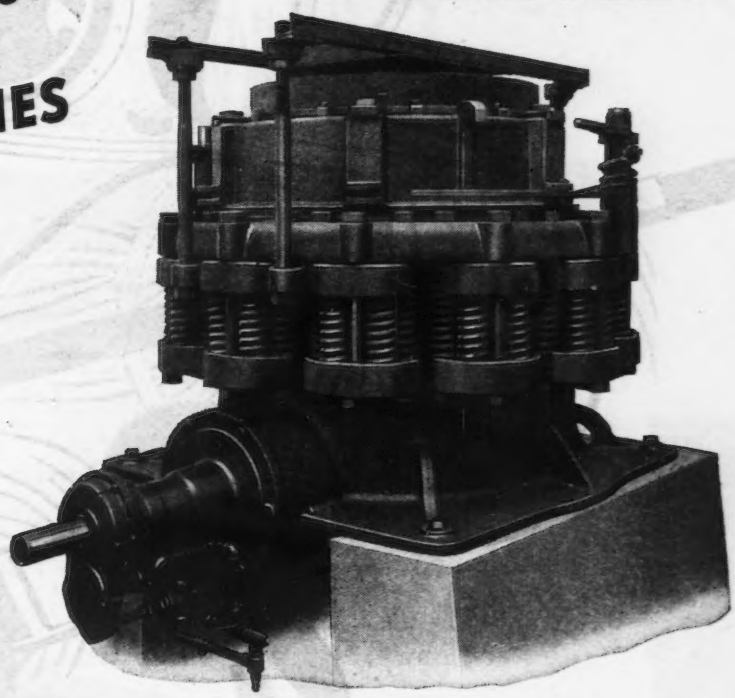
Howe Sound Co.
Cia Minera Asarco
Cia de Real del Monte y Pachuca
Fresnillo Company
San Francisco Mines of Mexico
Minas de Guerrero, S. A.

South America

Cia Minera Aguilar, S. A.

United States

Anaconda Copper Mining Co.
American S. & R. Co.
American Zinc Co.
Bunker Hill & Sullivan M. & C. Co.
Combined Metals Reduction Co.
Eagle Picher M. & S. Co.
Federal M. & S. Co.
Hecla Mining Co.
St. Louis S. & R. Co.
Universal Exploration Co.
United States S. R. & M. Co.
American Zinc, Lead & Smelting Co.



Fine reduction crushing amongst the more important and even the smaller mines throughout the world is being done with Symons Cone Crushers. This partial list of lead and zinc producers who use Symons Cones is added proof of this claim.

One of the important steps in the recovery of metals is the securing of a uniform fine mill feed in greater quantity and at low cost. That this is accomplished with the use of Symons Cones is evidenced by their widespread use. If your operations call for fine crushing, join with major producers who are doing the job with cones.

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN
NEW YORK · LOS ANGELES · LONDON · TORONTO

NORDBERG MACHINERY

SYMONS CONE CRUSHERS

You wouldn't
S. Berger

put a diving suit on a *POLE VAULTER*

LAY·SET *Preformed* IS LIMBER

Putting non-preformed wire rope on your machines is like expecting a pole vaulter to make a record when dressed in a diving suit. You shouldn't expect a wire rope that is twisted tightly and under constant tension to operate well and long.

In Hazard LAY-SET Preformed every wire and strand is preshaped at the mill to the exact helix it must assume in the finished rope. That's why LAY-SET is at ease, relaxed, more flexible, and perfectly willing to work. Being free of torsional stresses and strains, being unhampered by twisted effort, Hazard LAY-SET Preformed lasts longer, gives you greater dollar value. Be sure your next rope is Hazard LAY-SET Preformed.

Hazard LAY-SET Preformed Wire Rope is "in the service" on countless jobs for the Armed Forces where it is proving its many advantages. Specify it for *your* use.

HAZARD WIRE ROPE DIVISION · Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Fort Worth, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma
AMERICAN CHAIN & CABLE COMPANY, INC. · BRIDGEPORT · CONN.

HAZARD LAY·SET *Preformed* WIRE ROPE

Galigher Engineering Starts from Scratch

Galigher engineering is expertly applied to both metals and mills. It starts with a determination of ore values, proceeds through all the steps of arriving at an economical recovery method and ends with the planning of the mill and the installation of suitable equipment. Our experienced engineers work in the laboratory and/or in the field. You may assign them the whole problem or any essential part.

METALLURGICAL SERVICE

Located in the heart of a great metals center, The Galigher Company has pioneered the way in many details of devising equipment and applying principles that lead to practical and profitable production. Galigher methods and machinery are in use throughout the world—in scores of large and small plants.

We invite your correspondence. Submit your problem in brief outline and our engineering department will promptly reply to your correspondence.

"There Is No Substitute for Experience and Service"

THE GALIGHER COMPANY

ORE TESTING LABORATORIES

British Mining Supply Co. Ltd. (Pty.)
Johannesburg, So. Africa

Established 1901

Metallurgical Division
83 South 2nd East Street
Salt Lake City, Utah

GOOD TO THE LAST HAUL

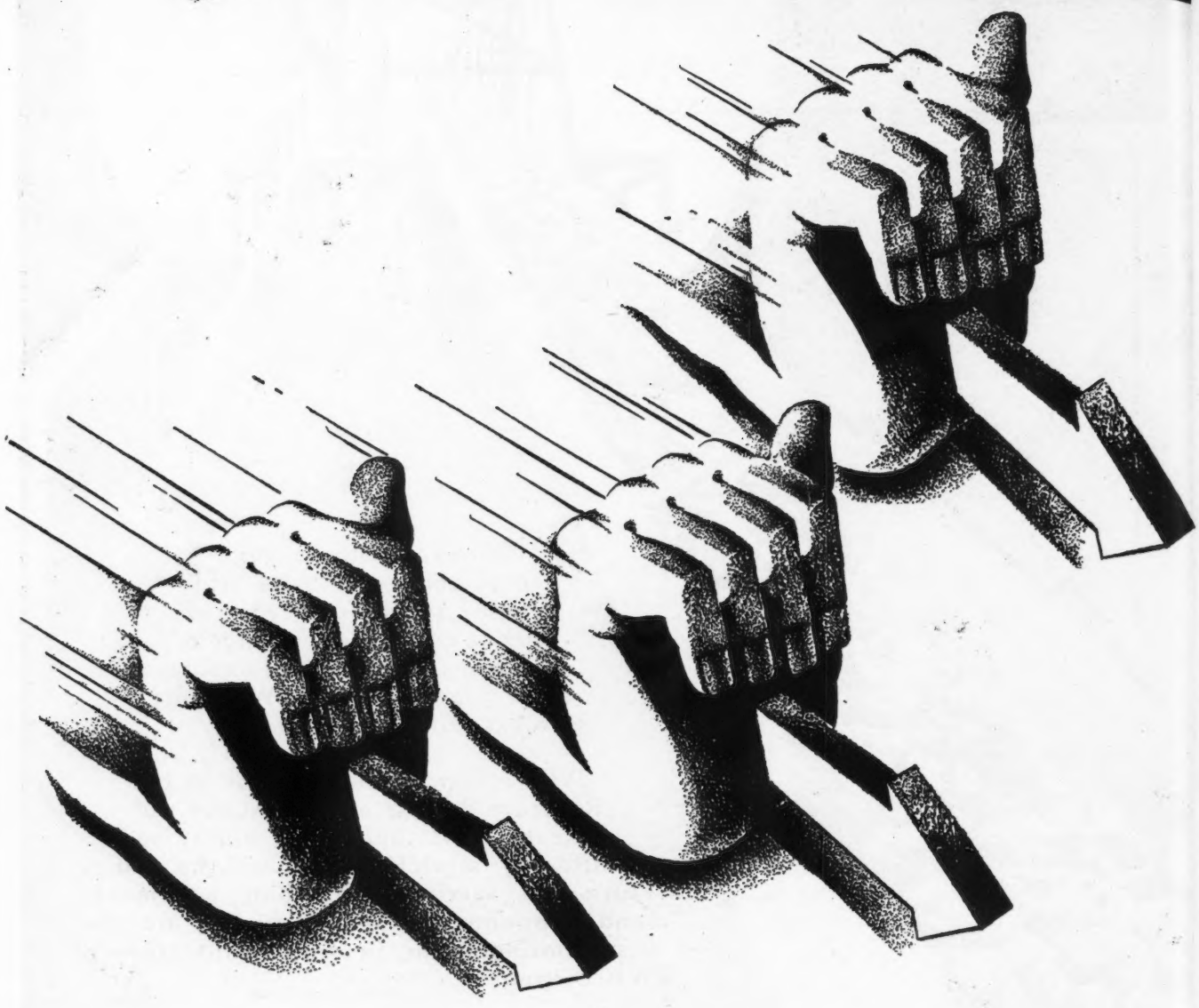
Our experience in building conveyor belts for highly specialized types of service covers a wide range of operating problems and enables us to guarantee that BWH belts give exceptional service.

BWH conveyor belting, made by the Rotocure Process of Continuous Vulcanization, is uniformly vulcanized, uniformly stretched, and will be uniform in service. Maximum efficiency and minimum cost in actual use are the first considerations in the manufacture of BWH belting.

BOSTON WOVEN HOSE & RUBBER CO.

WORKS: CAMBRIDGE, MASS., U.S.A. P.O. BOX 1071, BOSTON 3, MASS., U.S.A.

THREE NEW PARTNERS . . . GOING



TERMINAL TOWER
CLEVELAND, OHIO

AHEAD WITH DRESSER

DRESSER INDUSTRIES now number ten.

Formerly, we were seven companies helping to bring basic services to the user more efficiently.

Our three new partners, each a specialist in its fields, both round out and broaden Dresser's scope of usefulness. This larger Dresser group can now serve industry and consumers with more products and greater experience.

The new Dresser members are bulwarked by an organization that assures their customers continued progress in product improvement, greater wherewithal for pioneering research and steady maintenance of service.

Dresser Industries, Inc., has progressed through the management principle of giving to alert, independent know-how an adequate backing and pooled resources. From these, each member draws teamed strength far greater than it could enjoy alone. The three new members of Dresser Industries, Inc., increase opportunities for mutual aid among the teammates, and at the same time, draw from the group advantages for those they serve.

MEMBER COMPANIES

Dresser Manufacturing Division
Bradford, Pa.

The Bryant Heater Co.
Cleveland, Ohio

Clark Bros. Co., Inc.
Olean, N. Y.

Pacific Pumps, Inc.
Huntington Park, Calif.

Bovaird & Seyfang Mfg. Co.
Bradford, Pa.

Dresser Mfg. Co., Ltd.
Toronto, Ont.

Van der Horst Corp. of America
Olean, N. Y. Cleveland, Ohio

PLUS

*International Derrick & Equipment Co.
Columbus and Marietta, Ohio
Torrance, Calif. Beaumont, Texas

*Roots-Connersville Blower Corp.
Connersville, Ind.

*Stacey Bros. Gas. Construction Co.
Cincinnati, Ohio

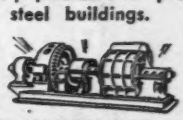
DRESSER Pipe couplings and repair devices for pipeline systems. Rings and forgings.

BRYANT Gas-fired boilers, winter air conditioners, furnaces, unit heaters and conversion burners for residential, commercial and industrial heating.

CLARK Engines and compressors for oil production and refining. Marine and stationary Diesel engines.

PACIFIC Hot-oil charging pumps; boiler-feed pumps; general-service pumps for the petroleum and other industries; oilwell plunger pumps; deep-well turbine pumps.

INTERNATIONAL DERRICK Oilwell pumping units, derricks and masts, drawworks, rotary tables and drilling units. Airport, communications and electric-power-line equipment and prefabricated steel buildings.



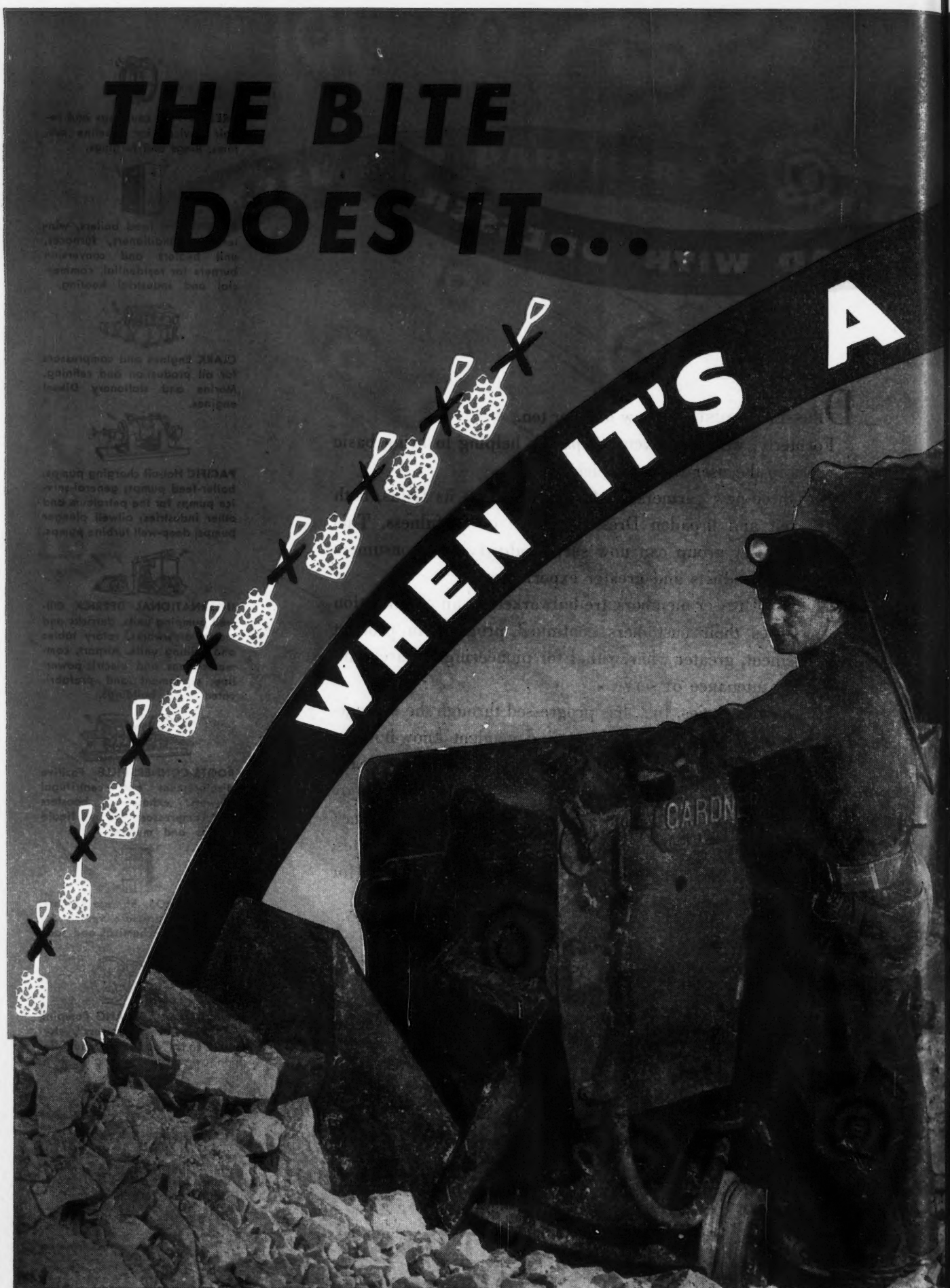
ROOTS-CONNERSVILLE Positive displacement and centrifugal blowers, exhausters, boosters and compressors. Air and liquid pumps and meters.

STACEY BROS. Storage holders, tanks and pressure vessels for the gas, oil, chemical and food industries.

BOVAIRD & SEYFANG Pumping engines, jacks, "powers", storage tanks and allied supplies and equipment for oilfields.

VAN DER HORST PORUS-KROME—a patented process of applying chromium lining on cylinder walls, piston rings and crankshafts—for longer wear.

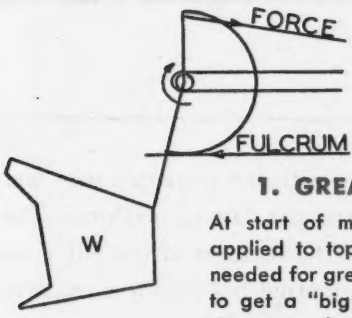
DRESSER INDUSTRIES
INCORPORATED


THE BITE
DOES IT...
WHEN IT'S A

"BIG BITE"!

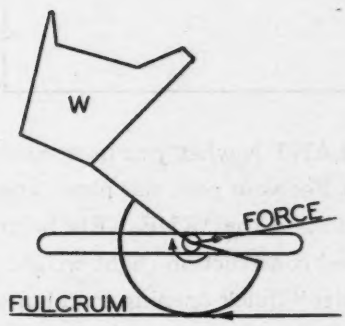
MORE TONNAGE . . . that's what the "Big Bite" means. The loader with the "Big Bite," the GD-9, picks up more rock . . . loads the cars out faster . . . makes your manpower more effective . . . speeds up the entire drilling cycle . . . even in blocky ground. For bigger tonnages . . . for lower operating costs, choose the loader with the "Big Bite": the GD-9.

HERE'S WHERE IT GETS THAT "BIG BITE"



1. GREATER CROWD

At start of mucking cycle, force is applied to top of rocker where it is needed for greater "crowding action" to get a "big bite." Small effective diameter of nearly empty winding reel adds power.

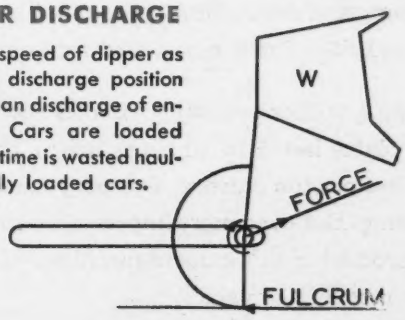


2. FASTER LIFT

Full dipper is raised clear of muck pile. Force is now applied to mid-point of rocker. This, plus the greater effective diameter of the full winding reel, increases speed of dipper as it nears discharge position.

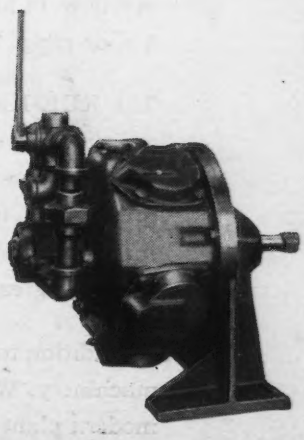
3. FASTER DISCHARGE

Maximum speed of dipper as it reaches discharge position assures clean discharge of entire load. Cars are loaded faster. No time is wasted hauling partially loaded cars.



4. MORE POWER

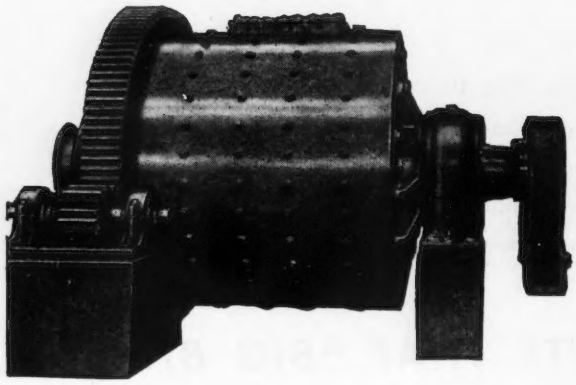
Two powerful five-cylinder radial air motors provide plenty of power to crowd into the muck pile and come up with a full-loaded dipper every time.

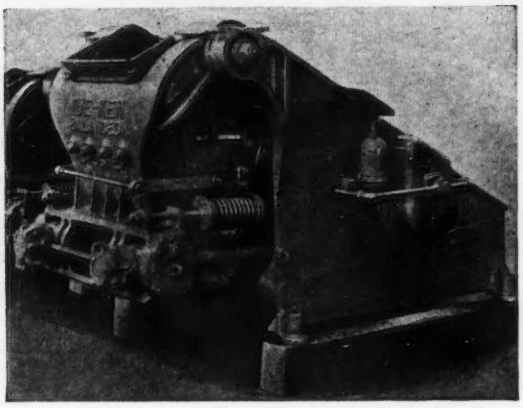


For complete information on the mine car loaders with the "Big Bite," write for descriptive bulletins. Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER
Since 1859

MODERN *equipment makes a* MODERN *plant*





A MODERN PLANT is what you must have to operate profitably with the increased post-war production costs. For your post-war plant, consider two really modern cost cutting machines. The Rib-cone ball mill and the *KUE-KEN balanced crusher. Some of the features of the Rib-cone mills are—all-steel construction (light weight with strength), large journal bearings and massive gearing, "Man-size" quick opening man-holes, manganese steel fitted throughout (the most economical in the long run), greatest grinding ability with least power and time out for repairs. Plain overflow, or low pulp line, or open end, or screening and convertible types of mills are available in a wide range of sizes. (This provides the type and size of mill best suited for your job).

The **KUE-KEN** balanced crusher doing "crushing without rubbing" makes economies that are unbelievable except to KUE-KEN users. Jaw plates last 5 to 10 times longer than in ordinary crushers. Power requirements are 50% to 75% less per ton crushed. Capacity usually 5 to 6 times greater than ordinary crushers of equal jaw opening. But even more important is the increased ball mill capacity when fed with the better crushed product of this modern machine—users report 25% to 100% greater mill capacity as well as better recovery of values.

In addition to the Rib-cone mills and KUE-KEN crushers, we make a wide range of other mining machinery. We welcome an opportunity to cooperate with you in your post-war planning for a modern plant.

* Pronounced Q-Ken.

970

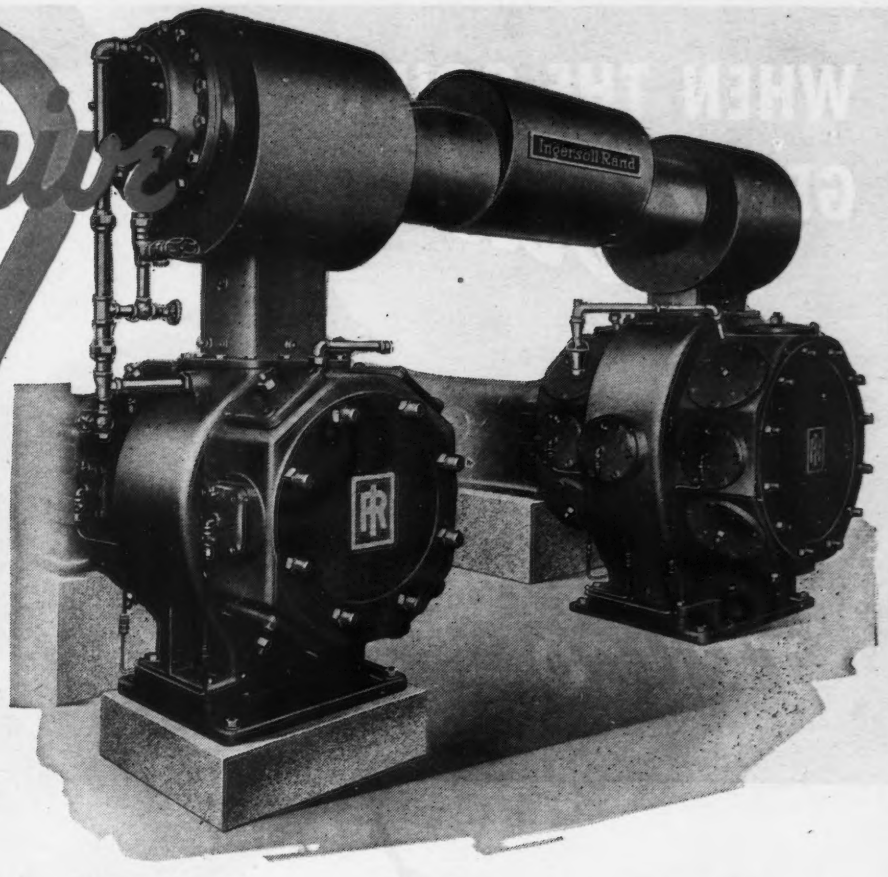
STRAUB MFG. CO.

445 Chestnut Street, Oakland 7, California

Kue-Ken Balanced Crushers	Rib Cone Ball Mills	Screenwheel Classifiers
Overhead Eccentric Crushers	Feeders	Amalgamation Barrels
Concentrating Tables	Spiral Classifiers	Standard or Sectionalized

Which drive?

- ELECTRIC
- STEAM
- OIL
- GAS
- BELT



THERE'S ALWAYS ONE BEST DRIVE FOR YOUR COMPRESSOR

Perhaps it's a direct-connected electric-motor which best fits in your over-all power layout . . . a synchronous motor improves the power factor.

Or it may be steam, especially when the exhaust can be profitably used in process work or heating.

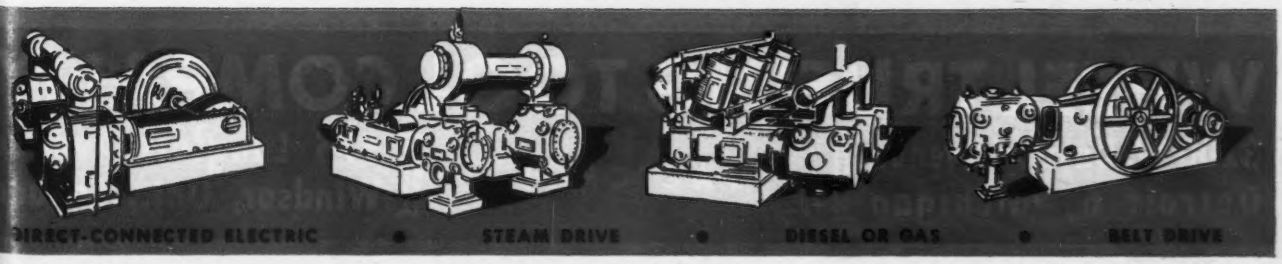
Then there are conditions best met by direct-connected oil- or gas-engine drive. In other cases, belt drive may be the correct solution.

But there is always *one best* choice, and there is no need to guess the answer. Ingersoll-Rand can furnish you compressors with any type of drive, and I-R engineers will be glad to study the problem with you, helping you select the compressor which best suits *your* conditions.

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

I-442



WHEN THE GOING GETS *Hard...*

Try a *TRUCO*

Engineered

PILOT-TYPE DIAMOND DRILL BIT

DESIGNED and BUILT by DIAMOND ENGINEERS WHO *KNOW* the PROBLEMS of MINING and DRILLING

RESETTING SERVICE

Prompt and expert resetting service on diamond drill bits is available at our factories in Detroit & Windsor.

Next time you're drilling blast holes or grouting in real tough conditions try a Truco Pilot Bit and see how it eats its way through formations usually considered too hard for any non-coring bit.

See how fast and clean it cuts without mudding or balling up and without that tendency to "wander" which concave bits sometimes show in rock of varying hardness.

This bit is turning in exceptional performance on standard drilling rigs in widespread field and underground operations throughout the United States and Canada. It's a really excellent bit; a time and money saver. You'll like it.

It is mounted with the finest quality diamonds set in a manner which has proved its exceptional cutting speed in both hard and soft formations. The patented matrix metal has the highest known holding qualities, so tenacious that recovery is far above average. Its high resistance to abrasion resists wear and prolongs the life of the bit.

Truco Pilot Type Diamond Drill Bits are available in all sizes and are backed by fast and expert resetting service at our factories in Detroit, and Windsor, Canada.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6, Michigan

FACTORIES

575 Langlois Avenue
Windsor, Ont., Canada

General Chemical "B&A" Reagent Acids and Ammonia

Quality* in *quantity shapes success...increases product potentialities. That's why, wherever *reagent grade mineral acids or ammonia in commercial quantities* are specified for industrial operations, General Chemical "B&A" high purity products are an outstanding choice nation-wide.

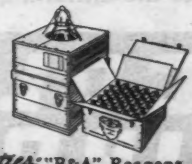
These reagents from America's foremost producer of mineral acids conform to exacting A.C.S. specifications. Their quality and purity are the result of General Chemical's progressive research and advanced reagent production technique, combined with invaluable "know-how" gained during almost half a century's manufacture of basic chemicals for industry.

Specify* and *rely on General Chemical "B&A" Reagent Acids and Ammonia for your operations. Remember...their dependability has been "proved in production" by America's leading manufacturers!

General Chemical Reagent Acids and Ammonia are produced by the Company's Baker & Adamson Division, makers of laboratory reagents and fine chemicals since 1882. The experience of this Division with high quality chemicals embraces over 1,000 purity products.

• • •

"B&A" Sulfuric Acid, Reagent, A.C.S.
Sp. Gr. 1.84
"B&A" Hydrochloric Acid, Reagent, A.C.S.
Sp. Gr. 1.18–1.19
"B&A" Nitric Acid, Reagent, A.C.S.
Sp. Gr. 1.42
"B&A" Ammonium Hydroxide, Reagent, A.C.S.
Sp. Gr. .90
"B&A" Acetic Acid Glacial, Reagent, A.C.S.



Quantities: "B&A" Reagent Acids and Ammonia are available in carboys as well as in five-pint or one-pound bottles, which are obtainable in case lots or less.

• • •

Stocked at key locations throughout the nation.

GENERAL CHEMICAL COMPANY
40 RECTOR STREET, NEW YORK 6, N. Y.

Technical Service Offices: Atlanta • Baltimore • Boston • Bridgeport (Conn.) • Buffalo • Charlotte (N. C.) • Chicago • Cleveland • Denver Detroit • Houston • Kansas City • Milwaukee • Minneapolis • New York Philadelphia • Pittsburgh • Providence (R. I.) • St. Louis • Utica (N.Y.)

Pacific Coast Technical Service Offices:
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AKINS Classifiers

Establish Pool Conditions Most Favorable for UNIFORM QUALITY OF OVERFLOW

LIMITED motion is essential in the settling pool of a classifier . . . to dislodge the finer particles from the heavier descending oversize. Uniform quality of overflow of course means better subsequent metallurgy . . . and uniformity can exist only if the motion is uniform, gentle, continuous.

Motion in the pool of an AKINS Classifier is exactly that . . . it is 'motion without commotion. And that is why no other type of classifier duplicates the uniform quality of overflow of the AKINS.

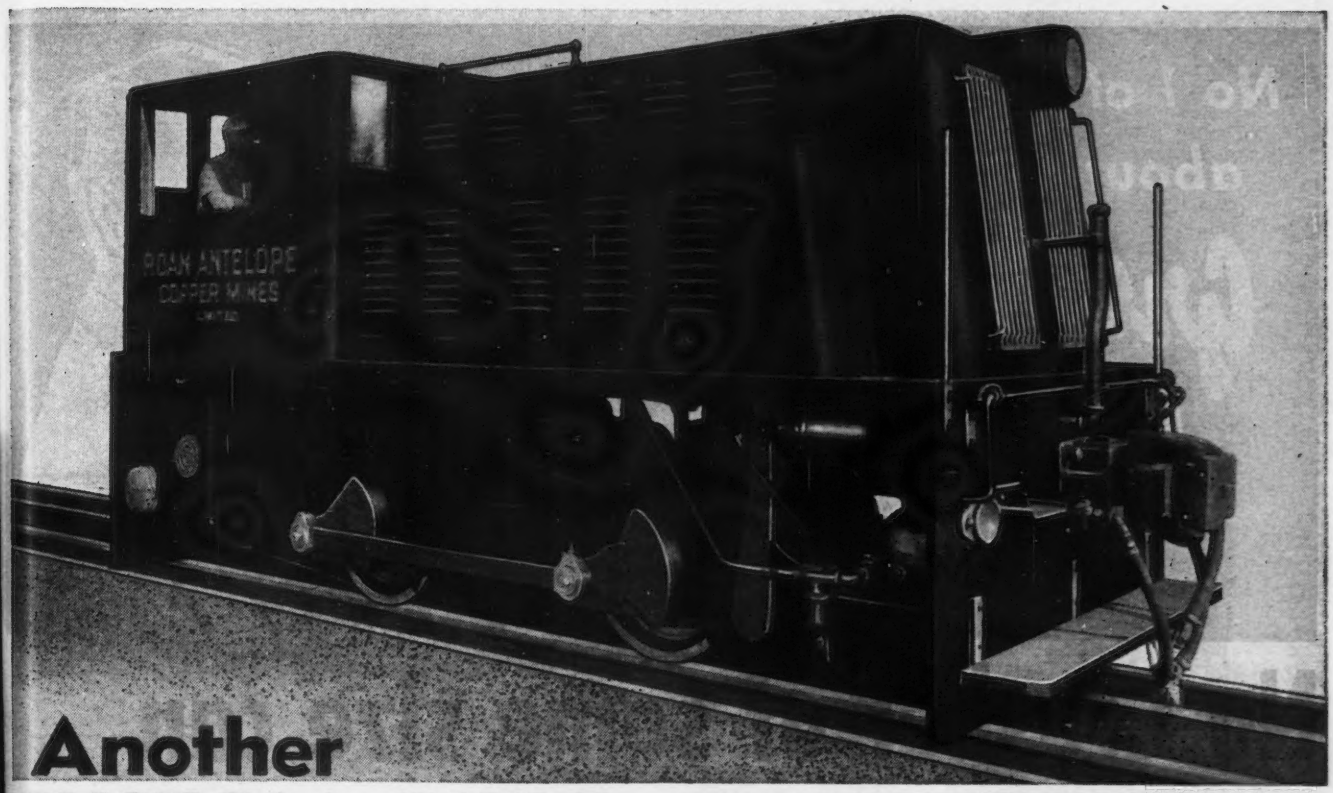
Competition between the various metals and between metals and plastics is certainly coming. To meet that competition you will need the most efficient flowsheet you can devise. Let us talk with your consultants about classifiers.

LOWDEN DRYERS
SKINNER MULTIPLE HEARTH ROASTERS
BALL, ROD & TUBE MILLS
SMELTING EQUIPMENT

COLORADO IRON WORKS Company

Canadian Locomotive Co., Ltd., Kingston, Ont., Can.
Vancouver Iron Works, Ltd., Vancouver, B. C., Can.
Head, Wrightson & Co., Ltd., Stockton on Tees, Engla
Head, Wrightson & Co., (So. Africa) Ltd. Johannesbu
The Clyde Engineering Co., Ltd., Granville, N. S.W.

MAIN OFFICE & WORKS: DENVER 2, COLO., U. S.



Another CUSTOM-BUILT DIESEL-ELECTRIC for "Roan Antelope"

Operating, as it does, in a remote section of Northern Rhodesia, Roan Antelope Copper Mines Ltd. must often provide for unusual requirements when selecting equipment. In this case it was necessary that the locomotive should be provided not only with air brakes and air-dumping equipment for one type of cars but also with vacuum-brake equipment for another type. Other special features included a "Dead Man's" control lever and very restricted height and width.

All of these requirements have been provided for in the locomotive illustrated above without sacrificing any of the high standards to which Vulcan always adheres and which have undoubtedly been instrumental in bringing us this SECOND REPEAT ORDER.

Write us regarding any industrial locomotive requirement—steam, Diesel, gasoline, electric or Diesel-Electric—wide or narrow gauge. Vulcan quality is always a profitable investment and Vulcan engineers are always ready to cooperate with purchasers in working out any necessary special features.

WORKING DATA

for 20-Ton Locomotive Illustrated Above.

PERFORMANCE

Tractive Effort, starting, lbs. (30% adhesion, with sand)	12,000
Tractive Effort, continuous, lbs.	5,500
Speed at continuous T.E., M.P.H.	7.3
Maximum Safe Speed, M.P.H.	20.0

MECHANICAL EQUIPMENT

One 6-cylinder Full Diesel Engine, rated 150 hp. at 1800 R.P.M.
One Duplex Water-Cooled Compressor—30 C.F.M.
One Duplex Water-Cooled Vacuum Pump—30 C.F.M.
One 3-Way Car-Dump Valve
One Double-Reduction Gear Box, Ratio—18.65 to 1
Westinghouse Straight and Automatic Air Brakes

ELECTRICAL EQUIPMENT

One Westinghouse Type 189-R5, D.C. Generator
One Westinghouse Type 1443-A D.C. Traction Motor
One Westinghouse Single-Station E.M. Control

DIMENSIONS

Track Gauge	3'-6"
Wheelbase	6'-0"
Length, over bumper	16'-6"
Width, overall	8'-0"
Height, to top of cab	9'-0"
Wheel diameter	33"

VULCAN IRON WORKS

WILKES-BARRE, PENN'A., U.S.A.

New York Office 50 Church St.

No 1 of 5 "KVS" answers about BETTER CRUSHING

Greater Capacity size for size!

No Crusher of same size can match the "KVS" Gearless.

The 5 "KVS" Answers

CAPACITY? Yes . . . . greater, size for size, than any other crusher.

POWER? Yes . . . . ALL power goes to CRUSHING, not just "gear-turning." None wasted!

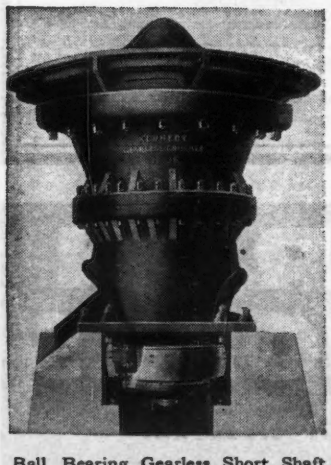
LONG LIFE? Yes . . . . In addition to general ruggedness, solid anvil grinding rings can be reversed when worn, thus giving two wears for each grinding ring and mantle.

MAINTENANCE? Yes . . . . We have very little! "KVS" simplicity and accessibility keep this cost LOW.

EFFICIENCY? Yes . . . . The highest. The adjustable side-opening and the "spring-hung" shaft are just two examples.

The answer is YES TO "KVS" when the question of OUTPUT comes up. No other crusher of the same SIZE can perform like the Ball Bearing Gearless "KVS" for the same amount of POWER. Another reason for "KVS" plus-capacity is the fact that fast continuous crushing can SAFELY be done on SOLID ANVIL GRINDING RINGS. We say "safely" because the shaft is hung from QUICK-RELEASE SPRINGS that guard against damage by "tramp iron" or other "foreign materials." There are a lot of other exclusive "KVS" reasons you should know about. To get them ALL—WRITE FOR THE "KVS" CATALOG. Each forthcoming advertisement in this series will simplify one of the 5 "KVS" ANSWERS. Catalog gives all the facts, quick. Ask for SPECIAL bulletins on mining, cement and pulverized coal equipment.

THE ANSWER IS "YES" TO "KVS"



Ball Bearing Gearless Short Shaft Standard Crusher with synchronous motor built-in pulley.

WRITE FOR THE "KVS" CATALOG . .

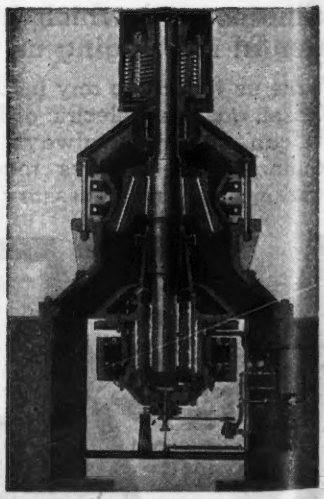
KENNEDY-VAN SAUN

MFG. & ENG CORPORATION

Representatives in all principal U. S. Cities

2 PARK AVENUE
NEW YORK, N.Y.

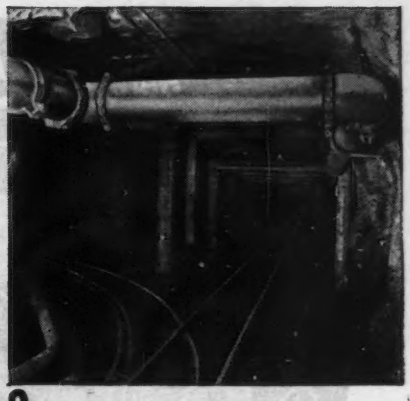
Factory
DANVILLE, PA.



Ball Bearing Gearless Type Low-Head Crusher for fine crushing.

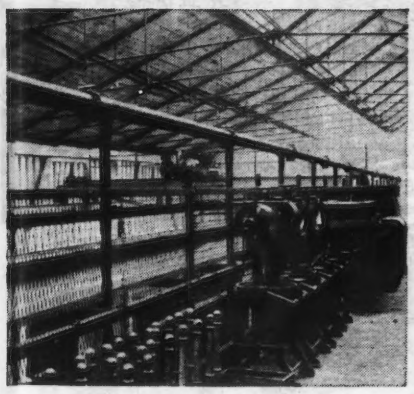
1. Speedy Victaulic Couplings for Invasion Pipelines in Italy, France, the Pacific.

2. Flexible Victaulic Couplings for America's "bridge of ships."

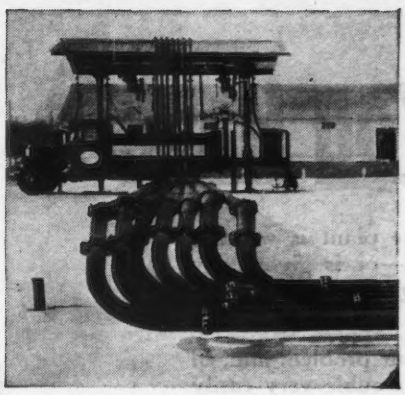


3. Self-aligning Victaulic Couplings for America's all-important mines!

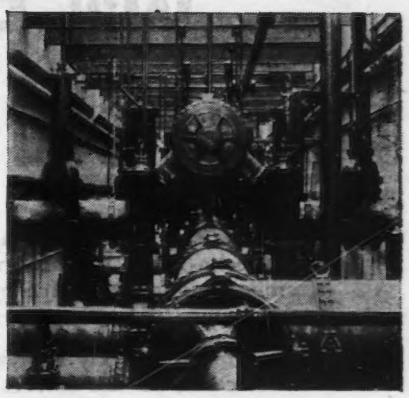
A BUSY YEAR...



4. Dependable, mechanically locked Victaulic Couplings that save man-hours for America's War Industry.

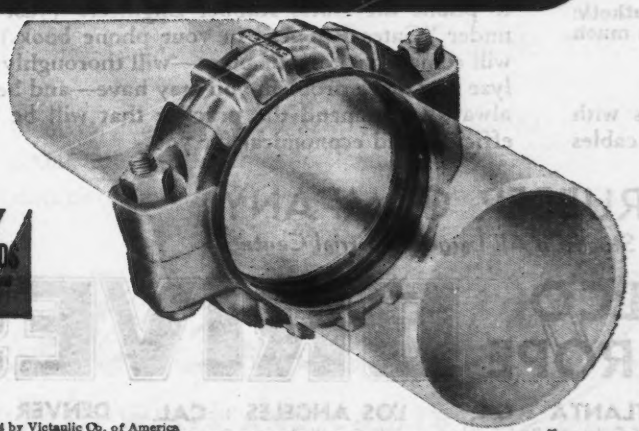


5. Proven, leak-tight Victaulic Couplings continuing more than a quarter century of service for America's Oil Industry.



6. Easily installed Victaulic Couplings for America's essential Municipal Works.

A BUSY FUTURE...



The very features which have made Victaulic Couplings indispensable in War . . . make them vital in reconversion, vital to the years of peacetime business ahead. Our couplings and Victaulic Full Flow Fittings will be available from the word "GO." For detailed information write VICTAULIC COMPANY OF AMERICA, 30 Rockefeller Plaza, New York 20, N. Y. *Other offices:* Victaulic Inc., 727 West 7th St., Los Angeles 14, California; Victaulic Co. of Canada, Ltd., 200 Bay Street, Toronto.

VICTAULIC

Reg. U. S. Pat. Off.

SELF-ALIGNING PIPE COUPLINGS AND FULL-FLOW FITTINGS

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OIL MINING MARINE MUNICIPAL INDUSTRIAL

Here are 5 TYPES of GATES V-BELTS

ONE of these five types Will Fit Any Need You Have!

Whenever a drive in your plant is wearing out belts faster than it should—or is giving any other trouble—just *pick up your phone* and call the Gates Rubber Engineer.

He can quickly analyze your problem and, in most cases, he can correct the trouble very easily without needing to specify the use of any special-structure belts.

There *are* service conditions, however, under which a V-Belt of special construction can most profitably be used—and your Gates Rubber Engineer can then supply a Gates V-Belt that is precisely engineered to meet the unusual conditions.

The Gates V-Belt of special synthetic rubber is a notable example. As a result of specialized research, Gates developed this synthetic rubber V-Belt and began supplying it in large quantities to industry more than six years ago. Under severe conditions of heat and oil, this Gates special synthetic V-Belt actually outwears any natural rubber belt by as much as 230%.

In your particular application, V-Belts with tension members composed of flexible steel cables —or of rayon cords—may prove to be the most efficient and economical. Again, Gates Static-Safety V-Belts may best fit yur special need.

In any case, the wisest move you can make is to phone the Gates Rubber Engineer. (Just look under "Gates Rubber" in your phone book.) He will come right to your plant—will thoroughly analyze any drive problem you may have—and he will always recommend the practice that will be most efficient and economical for you.

4412

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

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NEW BULLETIN

This new, concise, 2-color bulletin describes and illustrates all types of Hazard Mining Cables. Portable Cables, including Hazacord Reel Cables and Mining Machine Cables of various types — Shovel and Dredge Cables; Miners' Lamp Cord, Shot Firing Cord and many others, are followed by Hazard Mine Power Cables for Shafts and Boreholes in this handy condensed version of the 48-page Mining Cable Catalog No. 179.

Send for the NEW CONCISE HAZARD MINING CABLE BULLETIN, Hazard Insulated Wire Works, division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

INSULATED WIRES AND CABLES
for every mining use

HAZARD
Insulated Wire Works
Wilkes-Barre, Pa.

Gentlemen: Send me your NEW Hazard Mining Cable Bulletin.

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Company_____ Title_____

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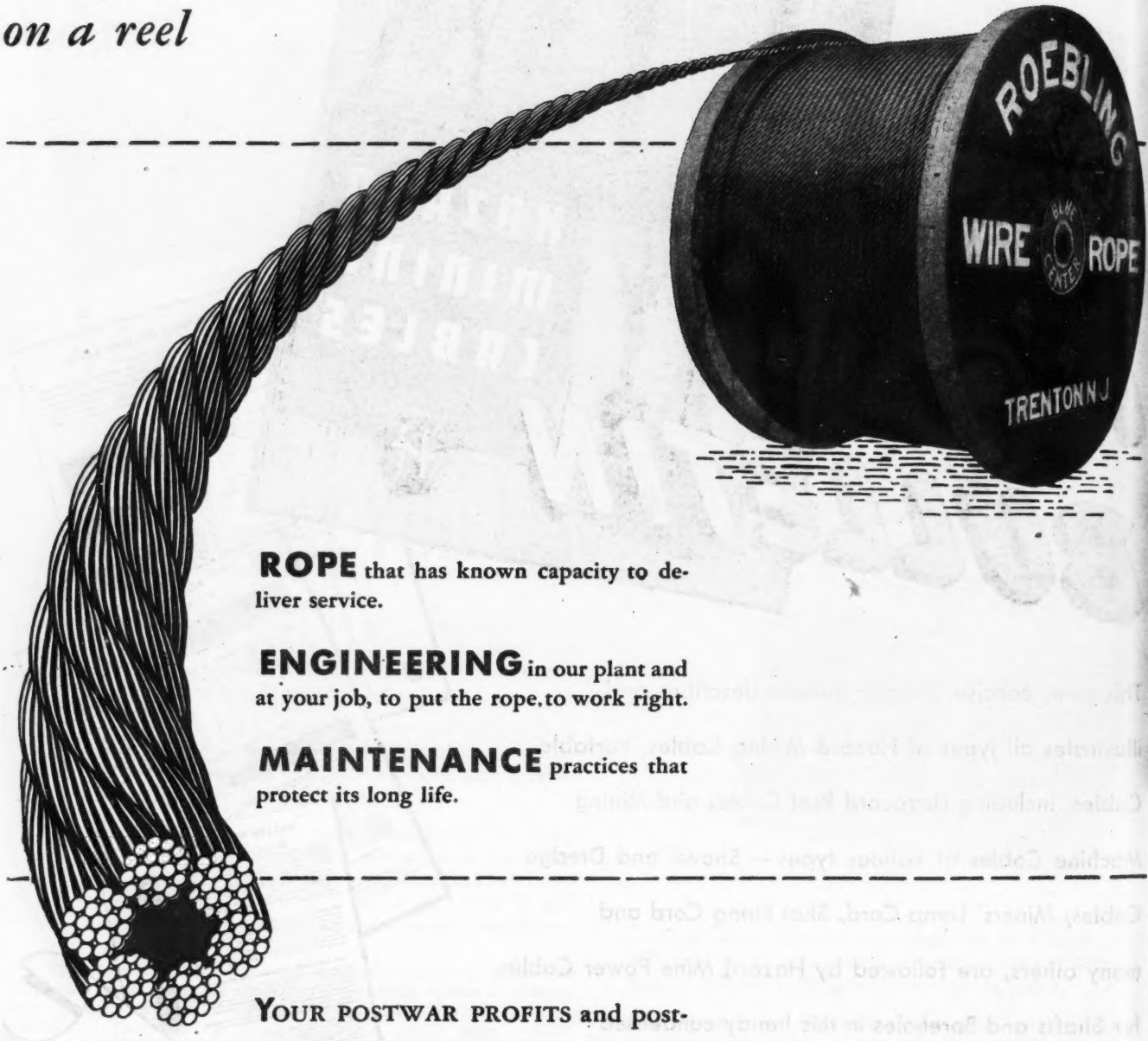
When you say, **"Make it ROEBLING**
'Blue Center'" *you buy a lot of things that can't be wound on a reel*



ROPE that has known capacity to deliver service.

ENGINEERING in our plant and at your job, to put the rope to work right.

MAINTENANCE practices that protect its long life.

YOUR POSTWAR PROFITS and postwar jobs will depend in part on operating rope-rigged equipment at lowest possible cost. You can leave that part to Roebling.

JOHN A. ROEBLING'S SONS COMPANY, Trenton 2, New Jersey
Branches and Warehouses in Principal Cities

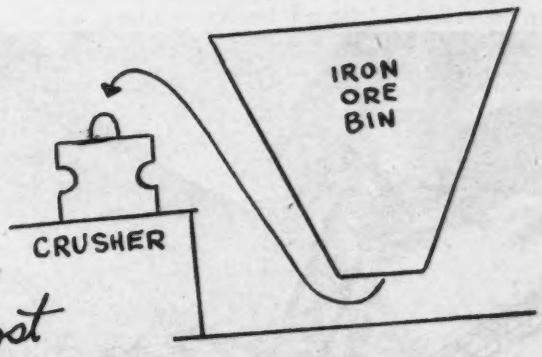
ROEBLING

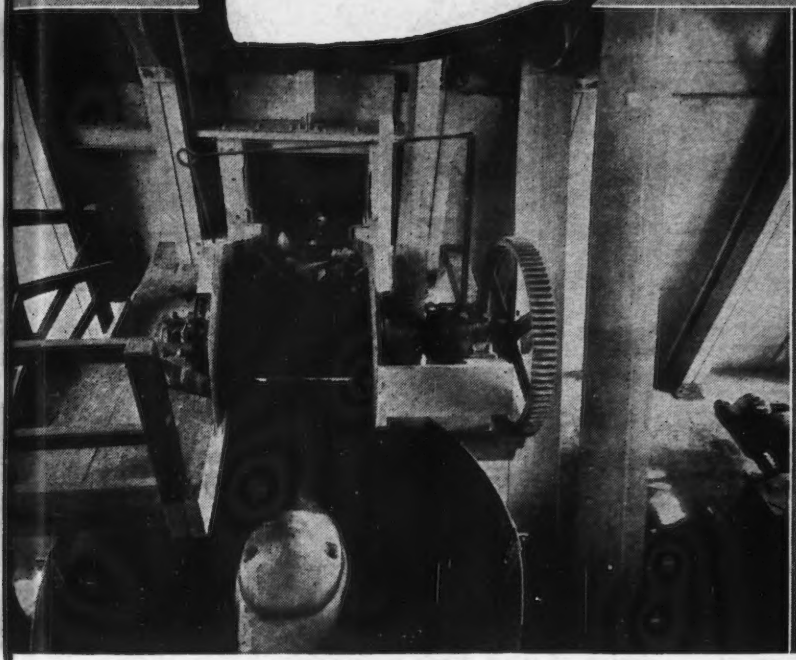
PACEMAKER IN WIRE PRODUCTS

WIRE ROPE AND STRAND • FITTINGS • COLD ROLLED STRIP • SUSPENSION BRIDGES AND CABLES • AIRCORD, SWAGED TERMINALS AND ASSEMBLIES • AERIAL WIRE ROPE SYSTEMS ELECTRICAL WIRES AND CABLES • ROUND AND SHAPED WIRE • HIGH AND LOW CARBON ACID AND BASIC OPEN HEARTH STEELS WIRE CLOTH AND NETTING

The Problem

within the limited space available to move iron ore from storage bin to crusher at low cost





HOW S-A *Solved the Problem*

If all material handling problems were exactly alike, a system could probably be ordered from a catalog with excellent chances that results would be satisfactory.

But all problems are *not* alike, as every mine operator knows. This, then, makes it doubly important that any proposed solution be the result of careful and thorough analysis of all the angles involved.

It was such analysis that resulted in the Stephens-Adamson installation shown here. With space definitely limited, and the incline from hopper to crusher fixed, the need was for equipment that would permit low cost handling of large tonnages of ore in spite of the limitations. S-A engineers recommended the Style "D" pan feeder. This unit reclaims raw iron ore from the hopper storage bin and moves it on an incline through an adjacent wall, feeding ore uniformly to a gyratory crusher.

It's another case of "the right equipment installed right"— a Stephens-Adamson service available to you.

Write us today.

STEPHENS-ADAMSON MFG. CO.

4 RIDGEWAY AVENUE, AURORA, ILLINOIS — LOS ANGELES, CALIF. ★ BELLEVILLE, ONT.

Designers and Manufacturers of All Types of

BULK MATERIAL HANDLING EQUIPMENT

YCGF No. 20; equipped with 18 cu. ft. buckets to dig 124 ft. below water level against a bank 50 ft. high; total weight 3,750 tons.

337 Dredge-Years

Placer dredging for gold was first tried in California about 1852, but equipment of that day was inefficient and the attempt abandoned. Soon after the turn of the present century a California company, Yuba Consolidated Gold Fields, started gold dredging operations in the same river where the early dredge failed. That company and its affiliated operating companies have accumulated 337 dredge-years of experience; most of their dredges were designed and built by Yuba Manufacturing Company.

Only from experience gained in actual placer dredging can the successful dredge of the future be designed. As dredging ground becomes more difficult to dig because of great depths, boulders, excessive sand or other reasons, it becomes more apparent that the design of your dredge cannot be left to chance. Two Yuba dredges in California dig deeper than 150 feet below ground level. Several dig more than 100 feet. Other Yubas in California operated successfully in ground so hard that previous dredging operations in the same fields were abandoned at great loss.

If your plans for the future include placer dredging, you are invited to consult with experts in the Yuba organization without obligation. Some Yuba dredge, no doubt, has successfully handled ground such as you have in mind.

YUBA MANUFACTURING CO.
351 California St., San Francisco 4, California, U.S.A.
AGENTS: Alluvial Dredges, Ltd., Renfrew, Scotland; London, England—Sime, Darby & Co., Ltd.
CABLES: Yubaman, San Francisco—Yardage, London

YUBA DREDGES — PROVED DEPENDABILITY ROUND THE WORLD

Carloads of Power

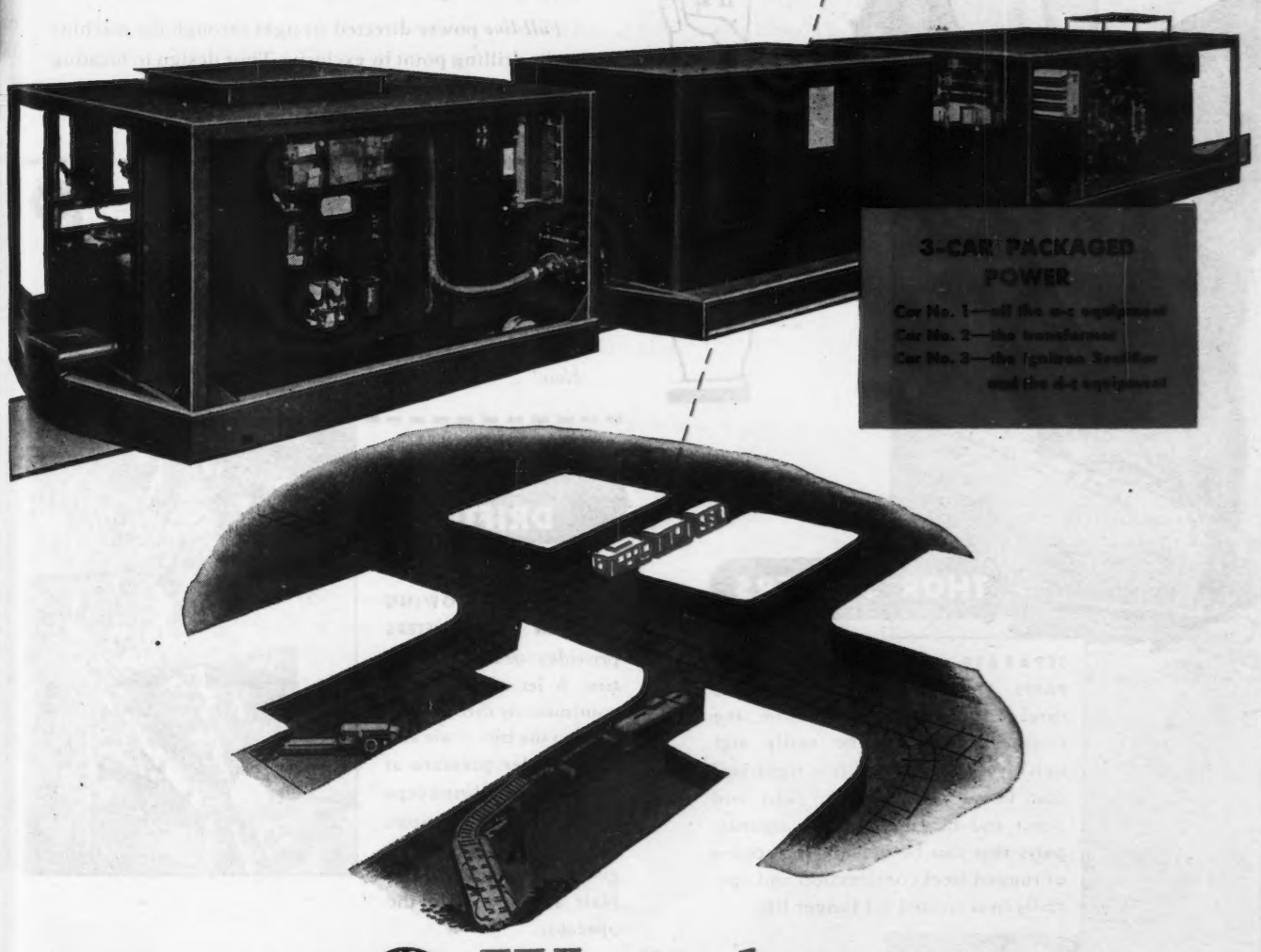
AT THE FACE

. . . where you need it most . . . delivered quickly and economically . . . over your regular haulage system, by this 3-car Portable Ignitron Rectifier train. Direct-current power to drive cutting machines, loaders, locomotives, etc.—without the voltage drop and power loss from long feeder lines.

. . . an exclusive Westinghouse development, the Ignitron Rectifier train actually provides a power substation near the face. The modern, light, compact Type ASL Air-cooled Transformer, built into this equipment, contains no inflammable or toxic liquids to leak or cause damage. Inerteen type transformer, if desired. Choice of pumped or sealed-tube Ignitron.

. . . the extreme flexibility, rugged construction and economy of operation has resulted in widespread acceptance of this equipment by the coal mining industry—units are in service in all of the important coal producing areas. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., Dept. 7-N.

J-94630



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PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

ELECTRICAL EQUIPMENT FOR THE MINING INDUSTRY

Everything you want in a Rock Drill...

GREATER POWER ★ FASTER DRILLING
EASIER OPERATING ★ LESS UPKEEP COST

Measured-Air VALVE ACTION

A positive short-travel tubular valve that powers all three types of Thor Rock Drills—Sinkers—Drifters and Stoppers—offers these advantages to provide *maximum forward and rotative power* . . . to assure *fast drilling:*

Powerful HOLE-BLOWING

Full-line power directed straight through the machine to the drilling point by exclusive Thor design in locating of exhaust ports provides exceptional hole-blowing power that offers these advantages:

Dependable ROTATION

Extra-heavy rifle bar assembly and positive-set ratchet action, plus *balanced* power piston action insures dependable rotation that *takes a fresh cut with every blow!*

THOR STOPERS

SEPARATE, QUICKLY REPLACEABLE PARTS—On all Thor Stopers, a threaded chuck, *separate* from the retainer body, can be easily and quickly replaced—yet is a tight seal that keeps out cuttings. Feed rod point and bearing are also *separate* parts that can be quickly replaced—of rugged steel construction and specially heat treated for longer life.

THOR DRIFTERS

TRIPLE HOLE-BLOWING FORCE IN THOR DRIFTERS provides *steady penetration.* A jet of air passes continuously through the steel to the bit . . . air and water under pressure at the point of drilling keeps the bit free of cuttings . . . and the hole can be given this extra *full-line* blast at the will of the operator.

CONCRETE GRINDERS
SAWS
AIR TOOL ACCESSORIES
SUMP PUMPS
BACKFILL TAMPERS
ROCK DRILLS
PAVING BREAKERS
CLAY DIGGERS

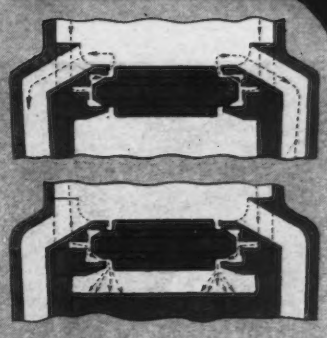
For complete information and specifications on all Thor Air Tools for mining and construction, write today for Catalog 42-A.

You Get in Thor ROCK DRILLS

● Only the precisely-measured quantity of air required can enter the machine—controlled by precision ground tolerances within .0002" between the valve flange and chest shoulders.

● Excess air which overloads the drill and staggers the stroke is eliminated *to reduce vibration . . . to extend the life of all working parts!*

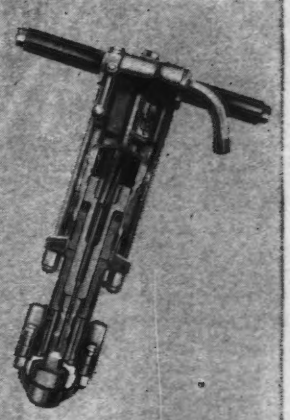
● Short-travel action reduces wear on the valve, which is heat-treated for durability and precision-ground for perfect fit—*extending the life of the valve itself!*



● *All* cuttings are blown free to keep the drill *cutting fresh* with every blow instead of pulverizing accumulated cuttings.

● Stalling is eliminated because the drill steel is kept free from cuttings. Drilling speed is retained at a *maximum* rate.

● The life of the steel itself is extended because cuttings can not jam around it. More holes drilled per steel . . . *less maintenance cost.*

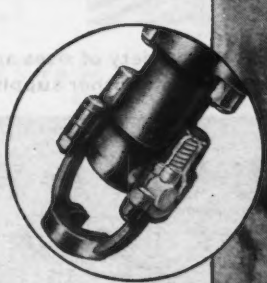


Automatic LUBRICATION

Built-in oil reservoirs distribute oil under high pressure to all operating parts each time the piston hammer delivers a blow—assuring smooth operation, longer life of all parts.

THOR SINKERS

ENCLOSED RETAINER SPRINGS—All Thor Sinker Rock Drills are equipped with the new Thor *spring-enclosing* steel retainer which protects the springs from dirt and prevents clogging . . . providing steady, quick functioning of the locking device for changing drill shanks. Sealed at proper tension inside a steel cap, the enclosed springs cannot be over-tightened . . . *always* work easily.



Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO 6, ILL.

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Use a LONGYEAR WOLVERINE *for your* Underground Core Drilling

Combines Large Capacity and Extra Power with Light Weight

Here's what you get:

1. A sturdy and economical core drill of Longyear manufacture.
2. A drill easily moved into limited working spaces underground and quickly set up on double column mounting. For surface drilling a frame mounting is furnished.
3. Ample power with either an air or an electric motor.
4. Light weight. Air motor assembly without mounting weighs 305 pounds; with electric power, 395 pounds.
5. A Hi-speed screw feed type of drilling head in either E or A size.
6. Bit speeds up to 2400 r.p.m.
7. A drum or spool hoist, or a rod puller for lowering and raising rods.

Here's what you can do with a LONGYEAR WOLVERINE:

1. Drill underground holes to better than 800 feet, recovering EX size core. Capacity somewhat less for AX size.
2. Drill holes at any angle. Plenty of power for "up" holes as illustrated.
3. Exploratory drilling to discover new mineralized areas.
4. Determine location and limits of such areas. Secure core and sludge samples for analysis. Prove up values.
5. Drill blast holes.

Here's what some users say:

"At end of todays shift the hole was 1150' and still going" —"A well balanced steady driller, doing a swell job"— "The electric Wolverine is the most satisfactory drill we have had for blast hole drilling."

Longyear core drills are manufactured in a variety of sizes and models with capacities from 100' to 8500'. Longyear rods, bits, core barrels and other supplies are carried in standard sizes.

E · J · LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U. S. A. NEW YORK OFFICE: 1775 BROADWAY

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on the tailings | hard digging | removing overburden | feeding the grizzly

Yes— NORTHWESTS WILL BE BUILT IN A FULL RANGE OF SIZES

18 SIZES

3/8 yard capacity and larger —a size for every mining problem

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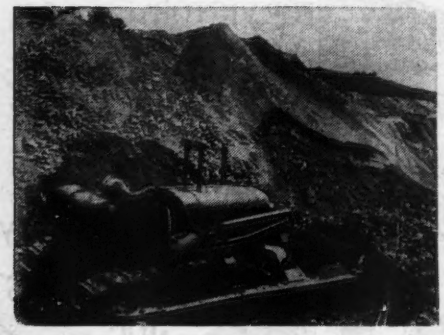
NORTHWEST

After VICTORY Buy NORTHWEST

ESSENTIAL TO PROFITABLE MINING

Western Fluorspar Corp., Cowdrey, Colorado, has modernized its operation with the Model HD-10, 2-cycle Diesel tractor. Equipped with a Gar Wood 'dozer, it quickly handles stockpiling, road-building, moving of heavy equipment and material.

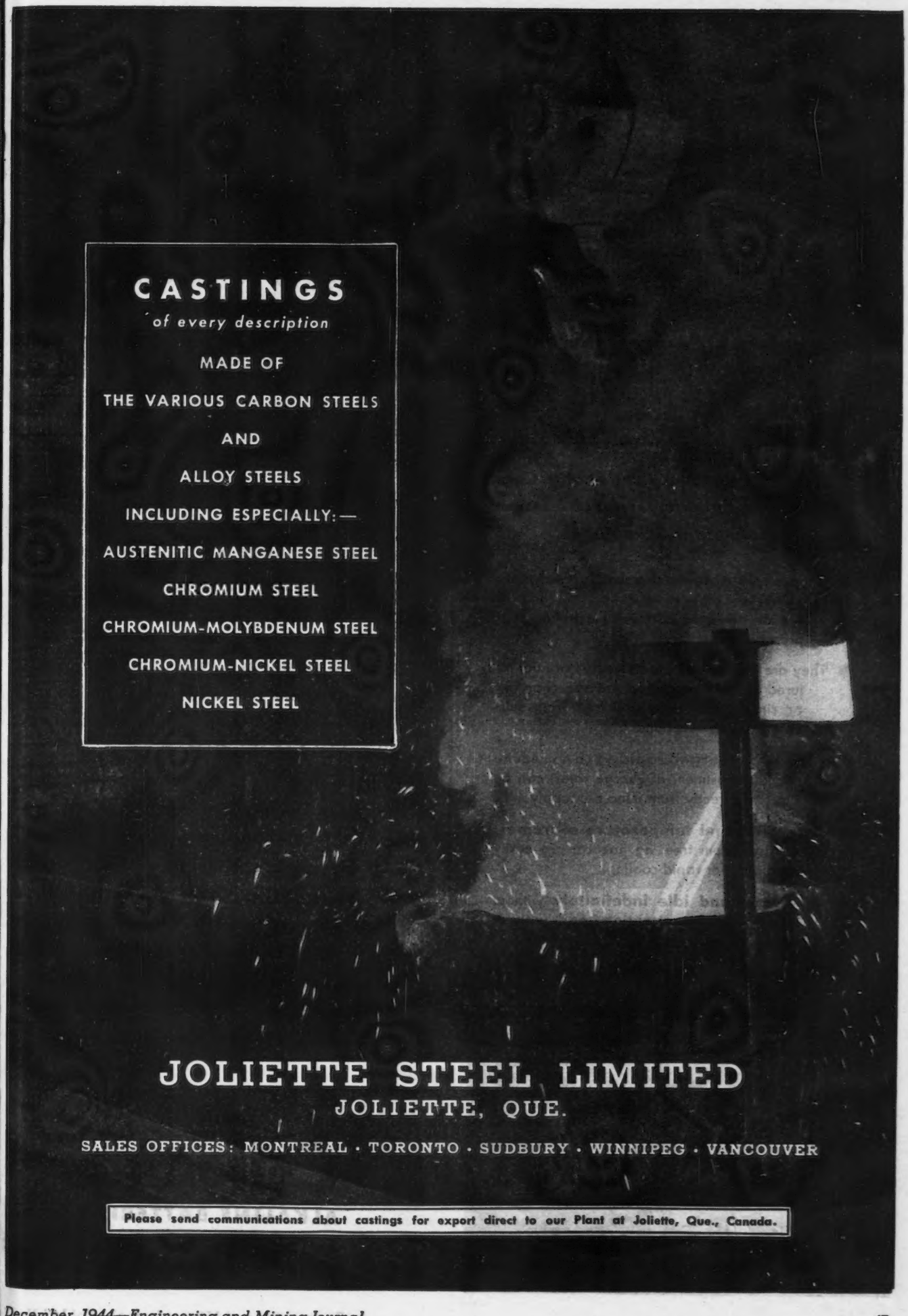


To meet postwar competition it will be necessary to change to new, short-cut methods of handling ore. There's no returning to normal as we once knew it . . . we are headed toward a *new normal* . . . a *new* world.

Be ready! In many ways modern, 2-cycle Diesel tractors can help you cut cost, increase production. For here is NEW POWER . . . fast-moving, economical, smooth-operating! These units will enable you to step up your stripping, road-building, cleaning-up . . . help you move materials and heavy equipment more quickly. They fit right in with the new tempo . . . the new tools . . . the new ways of getting things done. It is 2-CYCLE . . . the modern Diesel for modern mining! Get all the facts. See your Allis-Chalmers dealer.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.


CASTINGS
of every description
MADE OF
THE VARIOUS CARBON STEELS
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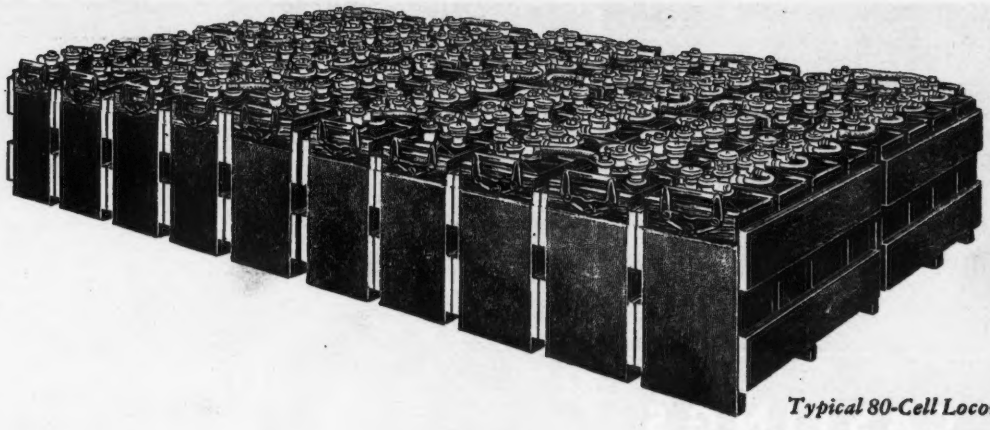
Please send communications about castings for export direct to our Plant at Joliette, Que., Canada.



Typical 80-Cell Locomotive Battery

WHAT USERS DISCOVER

In Mine Locomotives and Shuttle Cars Alkaline Batteries Give You These Important Advantages

- They are **durable mechanically;** grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel.
- They are **foolproof electrically;** are not injured by short circuiting, reverse charging or similar accidents; are free from self-deteriorating reactions.
- They can be **charged rapidly;** do not require critical adjustment of charge rates; can be charged directly from mine d-c supply.
- They **withstand temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling.
- They can **stand idle indefinitely** without injury, without attention, and without expense.
- They are **simple and easy to maintain.**

Ask a user of Edison Alkaline Batteries what he thinks of them as power units for locomotives and shuttle cars. The chances are he'll say they provide the closest approach to failure-free uninterrupted haulage power he knows of — and are economical, too.

He may at some time have had a wreck — such as a locomotive falling into a shaft or rolling down the side of a waste dump — and found that the battery not only survived with little or no damage but later went on and delivered full service life.

Or, he may have discovered that he can use "worn-out" motive-power batteries for various kinds of lighter-duty standby work for which their capacity is still ample, and thus can get more years of dependable service from them.

As a matter of fact, it is only by actually using Edison Alkaline Batteries that a person finds out how dependable and economical they really are. *Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J.*

Edison
ALKALINE BATTERIES

TOURNAPULLS
• Speed Mining Operations on British Guiana Bauxite Property

Demerara Bauxite Company uses LeTourneau fleet to strip overburden; build, surface roads; clear land and build railroad grades

To speed handling of its wide-scale mining operations in British Guiana, progressive Demerara Bauxite Company has added 2 150 h.p. Super C Tournapulls to its fleet of 25 Le Tourneau Carryall Scrapers, 12 Dozers and 2 Rooters.

BIG TIRES PROVIDE FLOTATION

These fast-moving, 15-yard Tournapull-Scraper units, with their 14.9 m.p.h. speed, are building roads in tough, sandy working conditions. Their big-diameter, low-pressure pneumatic tires enable these self-propelled scraper rigs to keep moving, where small-tired trucks bog down.

ROAD SURFACING—A PROFITABLE "EXTRA"

Like all big-capacity scraper units, these Tournapulls are loaded with aid of a pusher, haul and spread their loads in fast-moving cycles. Here, Demerara Bauxite Co. takes fullest advantage of Tournapulls by using them to spread bauxite on the roadbed for a high-speed, all-weather surface—a Tournapull specialty.

GIVE SCRAPER COSTS ON TRUCK HAULS

Like this alert mining company, you will find, too, that the faster power of Tournapulls will: (1) Give you job-proved Carryall Scraper earthmoving economies at truck speeds—on both long and short haul work. (2) Enable you to do more work with fewer men and machines, because they are self-contained, loading-hauling-spreading units; are one-man operated.

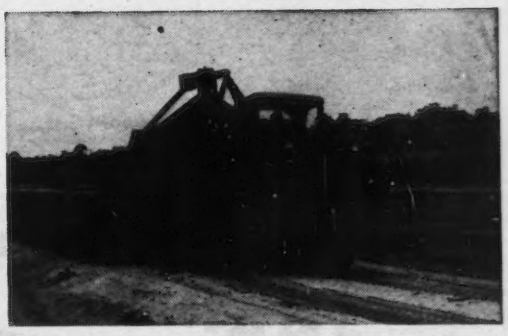
For more information on what Tournapulls can do on your roadbuilding, stripping and other mining jobs, write direct to Dept. EMJ-1244.

JOB-PROVED
OVER 2400 TOURNAPULLS BUILT AND SHIPPED

LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

Also, LeTOURNEAU (Aust.) Pty. Ltd., Rydalmere, N. S. W., Australia
Mfrs. of: TOURNAPULLS*, ANGLEDOZERS*, BULLDOZERS, TILTDOZERS*, CARRYALL* SCRAPERS, POWER CONTROL UNITS, ROOTERS*, TOURNATRAILERS*, TOURNACRANES*, TOURNATRUCKS*, SHEEP'S FOOT ROLLERS, TOURNAROPE*, TOURNAWELD*, TOURNALIFTS*.

*Trade Mark Reg. U.S. Pat. Off.



BUILDING, SURFACING ROADS is assigned to Tournapulls on Demerara Bauxite Co.'s British Guiana property.

STRIPPING SAND OVERBURDEN, ranging from 1 to 60 feet deep. LeTourneau Carryall Scrapers strip and get big loads as efficiently along the 1-foot layer as they do on the 60-foot overburden sections.

BUILDING 40-MILE RAILROAD GRADE—almost half of it double-track line—is handled by part of Demerara Co.'s fleet of 25 LeTourneau Carryall Scrapers.

CLEARING RIGHTS-OF-WAY—Demerara Bauxite Co. uses 12 LeTourneau Dozers for its heavy clearing, interchanges Dozers with Carryalls to finish grades—smart tractor-saving operation!

"...the TELSMITH Crusher has now passed 2,700,000 tons of ore in 14½ years and has commanded our appreciation for excellence."

SHENANDOAH -DIVES says...

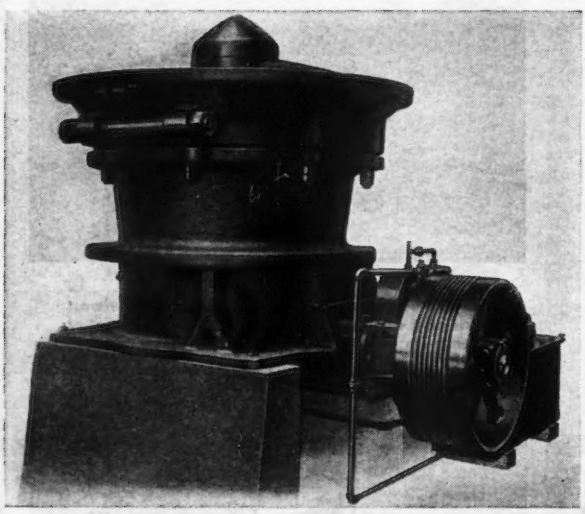
● The above quotation is from the Shenandoah-Dives Mining Company, Silverton, Colorado—Mr. Charles A. Chase, General Manager.

Their mine is about 11,200 feet above sea level, near the summit of the mountain range. Their crusher, installed underground at the mine, is a 16-A Telsmith Gyratory Breaker. In the last fourteen and a half years it has greedily gulped down 2,700,000 tons of mine run ore . . . still likes ore as a steady diet . . . thrives on it . . . is ready for more.

That's Telsmith dependability in continuous crushing service. Mr. Chase has the word for it—*excellence!*

The high-speed streamlined Telsmith Primary Breaker of today is equally reliable, but *capacity is twenty-five per cent greater.* Cut steel drive gears and force feed oiling permit higher eccentric speeds and faster gyration. Larger head and concave diameters, with greater receiving and crushing area, allow faster feeding. *Get Bulletin B-1.*

MIN-19



TELSMITH PRIMARY BREAKER for Coarse Crushing is made in 7 sizes: 6-B to 25-B, 20 to 400 tons per hr. ● Other Telsmith Crushers include—Telsmith Jaw Crusher for coarse or intermediate crushing—Telsmith Gyrasphere Secondary Crusher—Telsmith Intercone Secondary Crusher. *Write for Telsmith Equipment Guide E-1.*

SMITH ENGINEERING WORKS, 502 EAST CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London EXPORT OFFICE: 50 Church St., New York 7, N.Y.

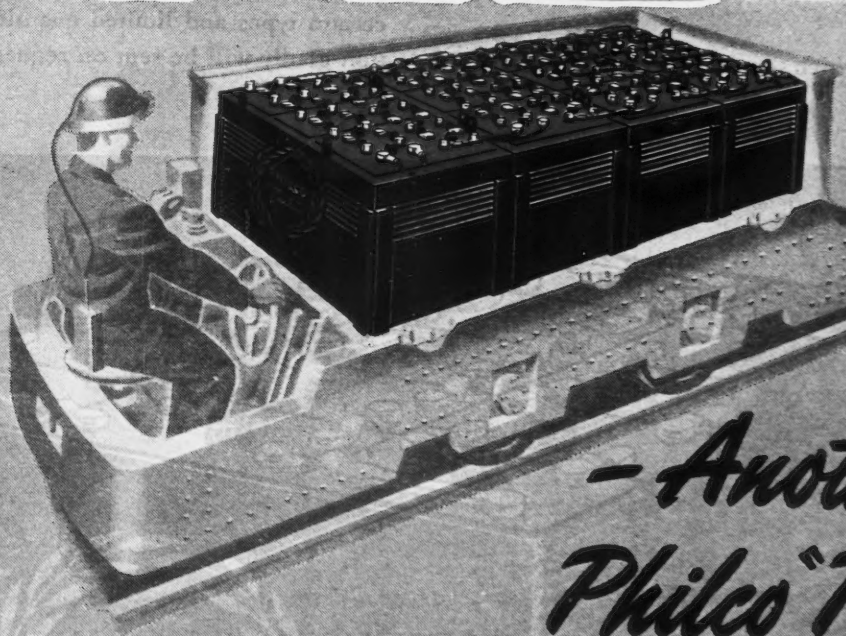
Samuel Osborn (S. A.) Ltd. Johannesburg, So. Africa · Armco International Corp. Buenos Aires, Argentina · 51 East 42nd St. New York 17, N.Y. · 211 W. Wacker Dr. Chicago 6, Ill. · Mine & Smelter Supply Co. Denver 17, Salt Lake City 11, El Paso · Mines Eng. & Equip. Co. San Francisco 4, Los Angeles 14

Canadian Vickers, Ltd., Montreal, Que. · Gordon Russell, Ltd., Vancouver, B. C. · Glenn Carrington and Co., Fairbanks, Alaska—Seattle 4, Wash.

PHILCO

Again in the News

THE BATTERY THAT GIVES 30% LONGER LIFE



—Another Philco "First"

Revolutionary new

PHILCO "THIRTY"

WITH 30% LONGER LIFE RADICALLY CUTS MINE BATTERY COST!

★ *Reduces depreciation and maintenance*
★ *Gets more work done*
★ *Packs a terrific wallop*

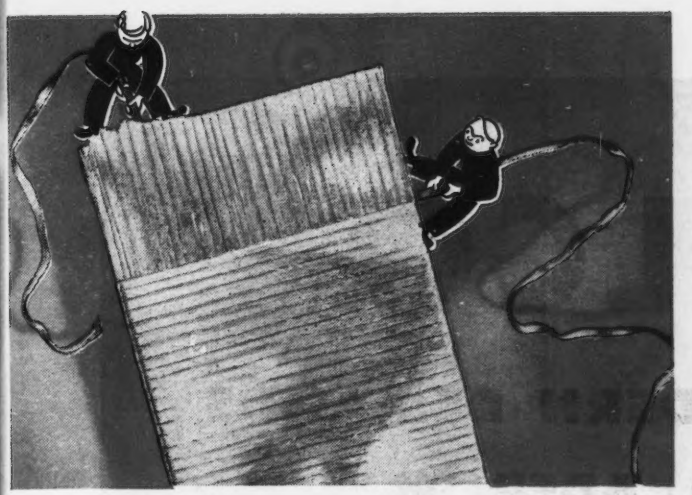
What every mine operator wants in a locomotive and shuttle car storage battery is **packed** into this amazing new Philco "Thirty."

In high capacity, it is **tops** in the field—assuring the maximum tonnage every shift. Even after long hours of heavy work, it has the reserve power to climb ramps and grades, and complete the shift in *high.*

But the feature which sets the new Philco "Thirty" entirely apart from all other batteries you have known, used, or even heard of before—is its phenomenal long life. **30% longer life**—often more—has been demonstrated time after time in exhaustive field tests.

Here, then, is more than just a new and better battery. Here is a new standard of battery performance—*and* a new yardstick by which all battery values must now be judged.

That's why it will pay you to get posted on this great new Philco Battery which is now available in certain types and limited quantities. Full information gladly will be sent on request.

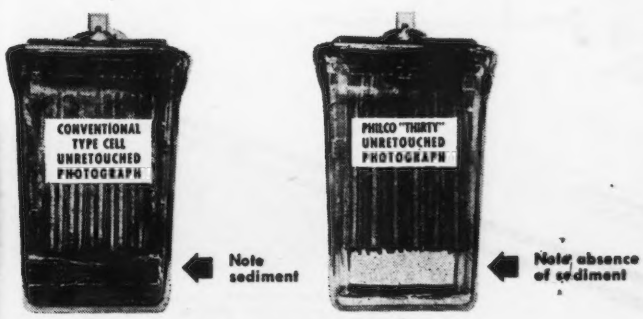


REVOLUTIONARY NEW PRINCIPLE OF PHILCO FABRICATED INSULATION*

Only PHILCO "THIRTY" has it!

Here is a brand-new construction principle *and* an ultra-modern application of a proven insulating material. Both the results of Philco pioneering! This material is fabricated glass tape wrapped around the positive plates in two layers, first vertically and then horizontally. Even a single layer of this glass tape insulation has been found to have better retentive power in holding the active material in the plate, than the standard glass mat! And—of course, the plates of the Philco "Thirty" are further protected and insulated with the time tested Philco slotted rubber retainer and rubber separator. **Patent applied for*

YOU GET IT FIRST WITH PHILCO



PROVED BY YEARS OF FIELD AND LABORATORY TESTS

As proved in scores of service tests, these unretouched photographs show what happens when a Philco "Thirty" cell (A) and a conventional type cell (B) are tested side by side in motive power cycle service, charged and discharged in series in the same circuit. Glass jars were used here only to permit observation. Note almost total absence of sediment in the Philco "Thirty", while the sediment space of cell B is filled. Cell B has delivered its normal life expectancy and is worn out—while the Philco "Thirty" still delivers over 100% of rated capacity, with a long margin of serviceable life still to go.

THE CLIMAX OF 50 YEARS OF LEADERSHIP IN BATTERY RESEARCH AND ENGINEERING

The procession of Philco "Firsts", covering the whole field of motive power and stationary batteries, has set the pace in modern battery design. Check the developments, which have contributed most to today's higher capacities, increased efficiency, longer life, and lower cost—the record shows *you get it first with Philco.*

PHILCO VITRABLOC

A development for telephone, control and standby service, that materially increases battery room capacities.

PHILCO FLOTE

The battery that exerted a major influence on the wider use of full float service, by eliminating low cells. More efficient . . . more economical to maintain.

PHILCO HIGH CAPACITY CELLS

Through modern plate design, Philco showed the way to increased capacity without increase in over-all battery dimensions. A tremendous advantage in many motive power operations.

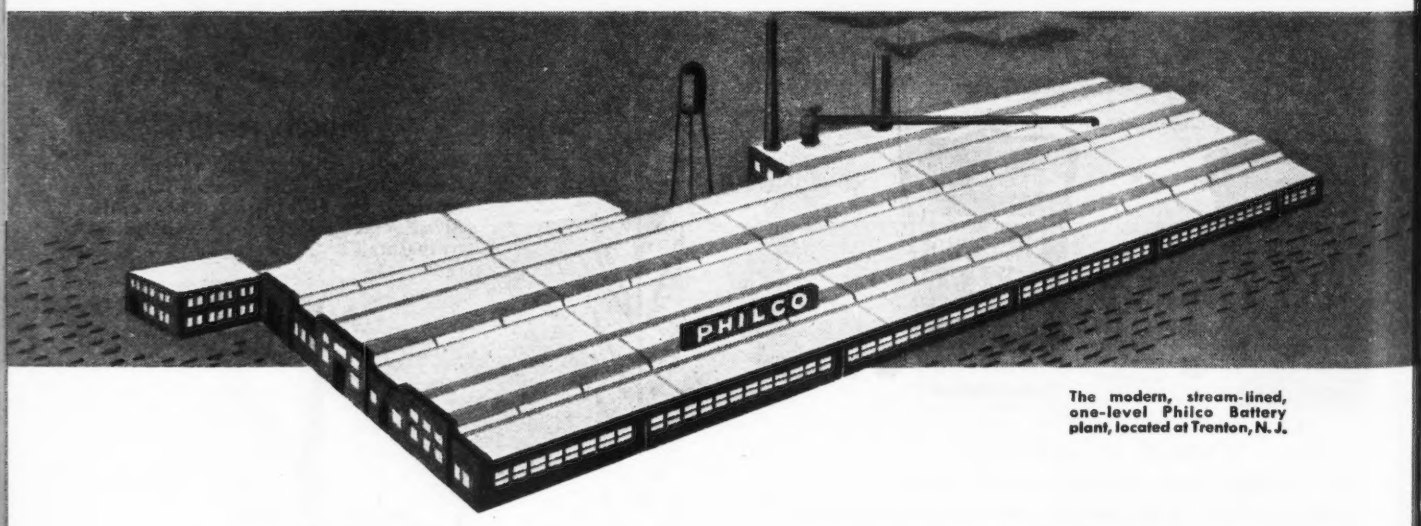
PHILCO

BUILT FOR MODERN DEMANDS BY THE LEADER IN MODERN BATTERY ENGINEERING

As described in the foregoing pages, Philco is ready, today, with the advanced battery performance and long-life economy you'll need in your post-war operations. With model manufacturing facilities, Philco is ready to produce these superior batteries in greater volume than ever before.

In the complete Philco line are modern storage batteries for all industrial applications—industrial trucks, mine locomotives and shuttle cars, diesel starting, railroad car lighting and air conditioning, control and power, telephone service and signal systems.

On your next purchase of storage batteries specify a modern Philco.

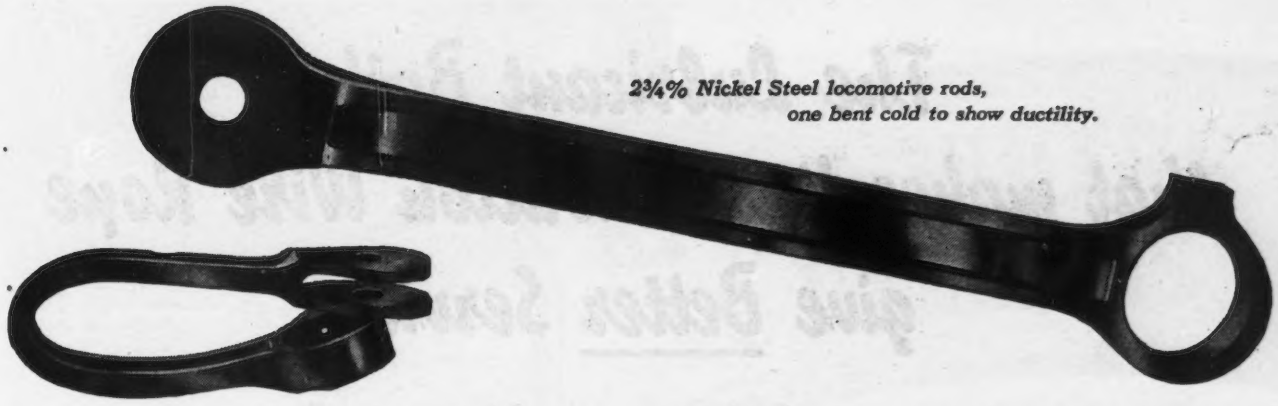


The modern, stream-lined, one-level Philco Battery plant, located at Trenton, N. J.

PHILCO CORPORATION

STORAGE BATTERY DIVISION • TRENTON 7, NEW JERSEY

For 50 Years a Leader in Industrial Storage Battery Development



2¾% Nickel Steel locomotive rods, one bent cold to show ductility.

QUENCHED AND TEMPERED NICKEL STEEL FORGINGS COMBINE

EXCEPTIONAL DUCTILITY WITH HIGH TENSILE STRENGTH

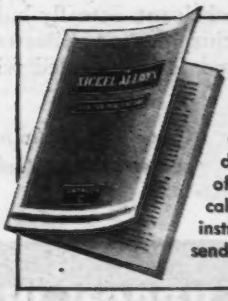
Composition and Typical Properties of Normalized Quenched and Tempered 2¾% Nickel Steel Rods

Description or Size	Melt Yield Pt. No. #s per Sq. In.	Tensile Strength #s per Sq. In.	Elong. % in 2 In.	Reduction in Area %	ANALYSIS					
					Car.	Mang.	Phos.	Sul.	Sil.	Ni
Main Rod....	92900	110000	25.0	64.4	.31	.78	.027	.026	.25	2.75
Main Rod....	86500	104500	25.5	65.6	.32	.86	.034	.032	.29	2.69
Main Rod....	86360	104400	26.0	64.8	.32	.86	.034	.032	.29	2.69
Main Rod....	87850	102350	26.0	66.2	.31	.89	.037	.025	.32	2.69
Front Rod....	86000	102250	25.0	67.3	.29	.82	.035	.027	.24	2.71
Front Rod....	83900	104250	25.0	66.1	.29	.82	.035	.027	.24	2.71
Front Rod....	86850	104250	27.0	66.1	.32	.86	.035	.025	.30	2.65
Front Rod....	89500	107050	25.5	65.6	.32	.86	.035	.025	.30	2.65
Back Rod....	89500	107650	25.0	62.7	.30	.79	.030	.025	.22	2.71
Back Rod....	87500	106450	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	87000	105600	25.0	65.4	.29	.82	.035	.027	.24	2.71
Back Rod....	88150	104850	26.0	66.8	.29	.82	.035	.027	.24	2.71

Specimens Taken from Mid-Section of Prolongations of the Forgings

The above table compiled by the American Locomotive Company shows the chemical compositions and mechanical properties of some normalized, quenched and tempered nickel steel front, main and back rods recently produced as replacement rods for locomotives being speeded up and rebalanced. These values are typical of replacement rod forgings recently tested by that company.

Quenched and tempered nickel steel forgings provide high tensile strength and ductility, combined with unusual toughness and high fatigue strength—qualities which tend to obviate breakage and assure long, trouble-free service when employed in heavy duty machinery and equipment.

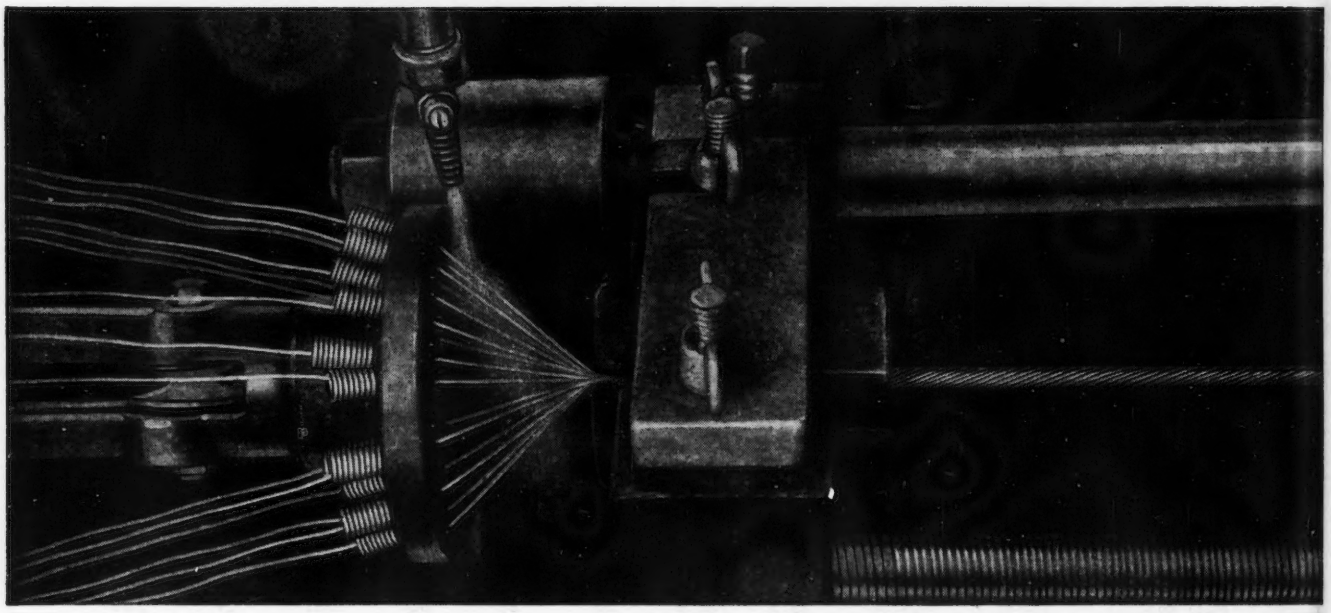


Catalog "C" makes it easy for you to get booklets and bulletins on industrial applications of Nickel, metallurgical data and working instructions. Why not send for your copy today?

* Nickel *

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y.

The Lubricant Bath that makes Upson-Walton Wire Rope give Better Service



EVERY wire in any length of Upson-Walton wire rope —and there may be 200 or 300 of them—is a *live* wire in the sense that *all are in motion when the rope is operating.* Every time the rope flexes, every wire in it moves.

Upson-Walton pre-lubrication therefore is of crucial importance to:

1—Prolong the life of the rope

2—Retard corrosion

3—Reduce friction within the rope itself and thereby prevent excessive wear, wire on wire and strand on strand.

Every foot of Upson-Walton wire rope is subjected to a pressure bath of lubricant, actually built into the rope in manufacture. By this method (illustrated above), every wire in every strand is surrounded with lubricant; every void between strands is a reservoir of lubricant and the core itself is *saturated* with lubricant.

The practical effect of pre-lubricating, as performed by Upson-Walton, is this:

1—It permits a better balanced loading of the rope.

2—Weight is distributed more equally between *all* wires; no one wire bears an excessive share of the load.

3—Every wire helps hold the load by easily slipping into the position where it helps the most.

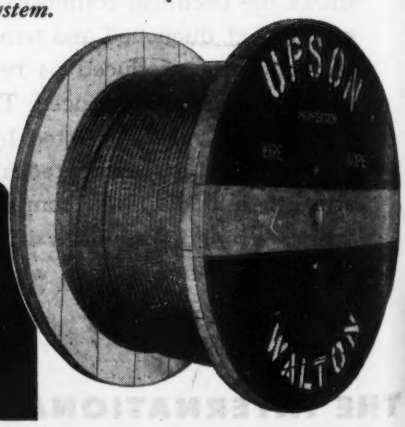
4—The rope can develop its full maximum strength and sustain greater loads than rope which might not be as efficiently pre-lubricated.

It pays to specify Upson-Walton wire rope—*with the built-in lubrication system.*

U-W

Established 1871

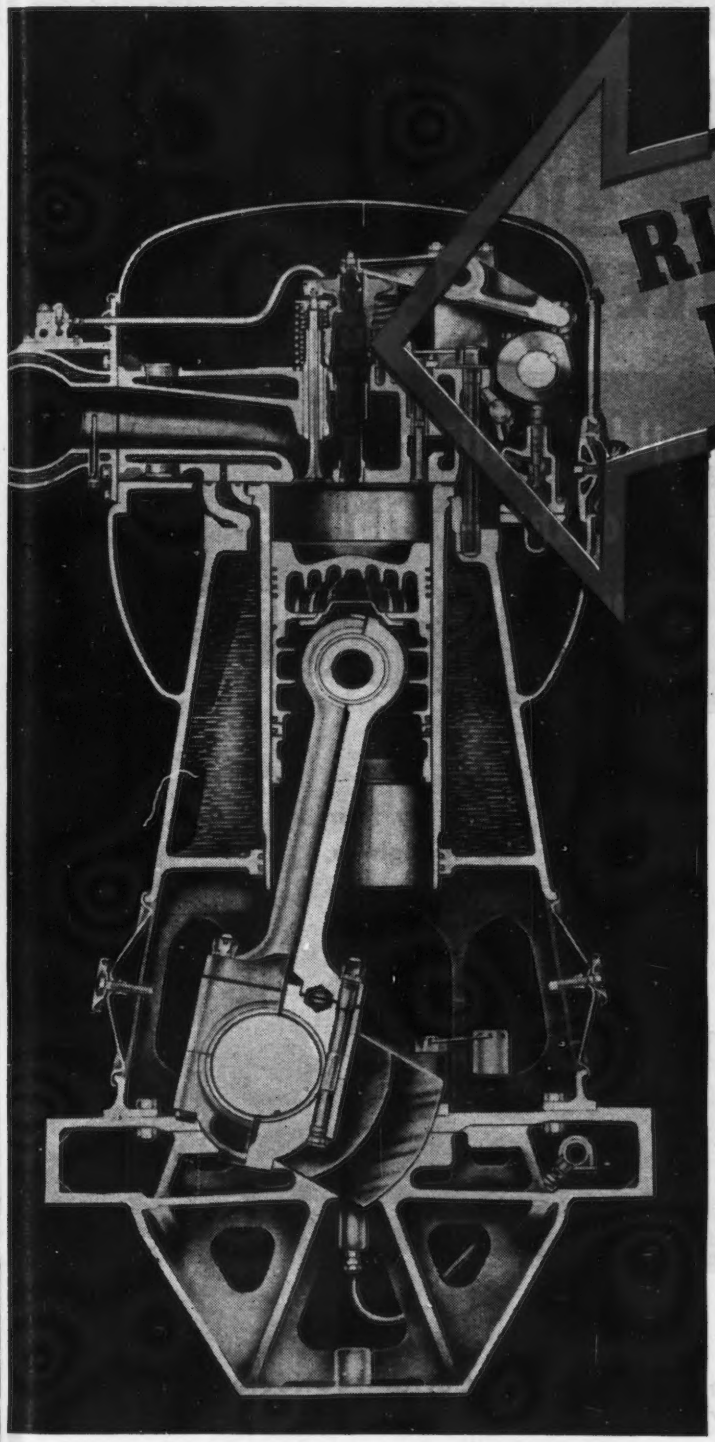
Upson-Walton also manufactures wire rope clips, thimbles and sockets; tackle blocks, snatch blocks, turnbuckles and shackles



THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

NEW YORK • PITTSBURGH • CLEVELAND • BUFFALO • CHICAGO



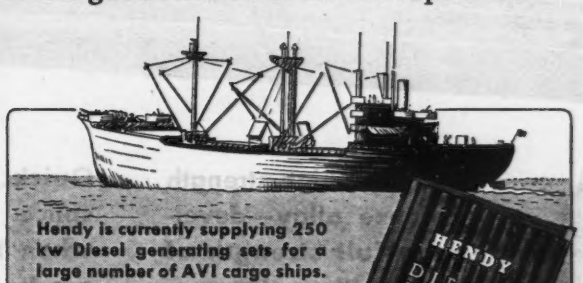
RIGHT WHERE IT BELONGS!

The unit-type fuel injector in Hendy Diesel Engines is right in the head...*logically* placed for satisfactory service under all load conditions, with *uniform* high-pressure fuel charge to *each* cylinder. This injection system provides individual fuel pumps for each cylinder...does away with long, high-pressure fuel lines... simplifies service because the entire unit can be easily removed for cleaning.

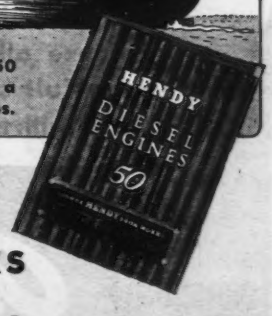
In addition to the unit-type fuel injector you'll find other important features too, such as...overhead camshaft, direct actuated dual intake and exhaust valves, and hydraulic tappets. All these features, *combined for the first time in a single engine,* reduce the number of wear points, simplify service and contribute directly to the lower maintenance costs a successful Diesel operator must have.

In marine service—or for stationary duty—Hendy Diesels can serve you well. They combine two great qualities...all the ruggedness for rough seas; all the good features for low-cost operation.

Hendy Diesels for marine or industrial service... 6 or 8 cylinders, 350 to 675 hp... are also available with Hendy generators as complete electric generating plants.



Hendy is currently supplying 250 kw Diesel generating sets for a large number of AVI cargo ships.



Write today for complete data—ask for the New Hendy Series 50 Diesel Engine Catalog.

JOSHUA HENDY IRON WORKS

ESTABLISHED 1856

SUNNYVALE, CALIFORNIA

Manufacturing Plants: SUNNYVALE, POMONA and TORRANCE in CALIFORNIA • AMPERE, NEW JERSEY • ST. LOUIS, MISSOURI

51-D-8

Branch Offices: BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN FRANCISCO • ST. LOUIS • WASHINGTON

WHY PUT "BUMPS" IN YOUR TROLLEY OVERHEAD?

. . . Let O-B Bulldog Splicers Help You Maintain Smooth, Continuous Trolley Wires Throughout Your Mine

Grips wire by top lobe. No excess metal surrounding wire to cause "bumps and hard spots."

Only four set screws to tighten.

Made of high-strength bronze alloy—develops full strength of wire with no slippage.

Quick, easy, visual splice. You can see when the two wires are butted together.

Current collector rides through unhampered on smooth, continuous trolley wire. There's no wear on the splicer; only normal wear on trolley wire.

Ohio Brass

MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

KEEP BUYING WAR BONDS

2505-M

Fight power shovel wear with STOODY SELF-HARDENING

BUCKETS

• If you're handling coarse materials, apply Stoody Self-Hardening in stringer beads parallel to flow of material. Deposit stringers in checkerboard patterns for maximum resistance to abrasion from fine, loose earth.

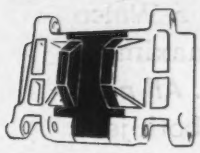
BUCKET TEETH

• Avoid solid deposits of Self-Hardening on bucket teeth. Stringers in various patterns give excellent protection when deposited parallel to or at slight angle to tooth travel.

TRACK ROLLERS

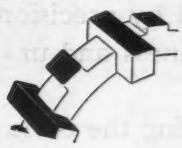
• Maintain track roller size by protecting rim with a single coat of Stoody Self-Hardening. Keeps shovel weight on rollers where it belongs, lowers wear on other track parts because of lower coefficient of friction and reduced track slapping.

TRACK PADS



• Stoody Self-Hardening keeps lugs out to size, retards wear on roller path, assures more accurate mesh with tumbler lugs, and reduces track-throwing due to worn track assemblies.

DRIVE TUMBLERS and IDLERS



• Stoody Self-Hardening maintains shape and dimensions of drive tumbler lugs, reduces abrasion and friction against track parts . . . lowers tendency of idlers to wear flat spots when working in fixed positions.

WHEREVER SHOVEL WEAR OCCURS, you'll get maximum protection with Stoody Self-Hardening because it gives double the wear of ordinary manganese electrodes, bonds firmly with manganese steels, and resists chipping even under the terrific impact encountered on bucket parts.

Stoody Self-Hardening is priced at only 50c per pound, f.o.b. Whittier or distributors' warehouse. Available through 600 U. S. distributors. Stoody's Specification Sheets give detailed hard-facing information on all types of heavy, earthworking equipment. Your copy is free—write today.

STOODY COMPANY

1140 WEST SLAUSON AVE., WHITTIER, CALIFORNIA

Distributed in Canada by:

G. D. PETERS & CO., LTD., Montreal & Toronto

GORDON & BELYEA, LTD., Vancouver, B. C.

STOODY HARD-FACING ALLOYS

Retard wear . . . Save Repair

IT TAKES JUST SIX STURDY PARTS TO MAKE A STRONG *Walco* WRENCH

Each of the six parts that make up a Walco wrench is designed to provide maximum strength, safety, and ease of operation. ***All parts are made entirely of steel.*** Handle and both jaws are drop forged steel, heat treated by precision methods to assure strength, toughness and uniformity.

Each part is replaceable including the exclusive Walco renewable lower jaw. This makes the Walco easy to maintain and good for an indefinite span of service—no matter how severe the service or how heavy the abuse.

Thousands of users prefer the Walco as the safest, strongest, most useful pipe wrench made. The Walco wrench is a product of the Walworth Company, manufacturers of valves, fittings and tools for over a century.

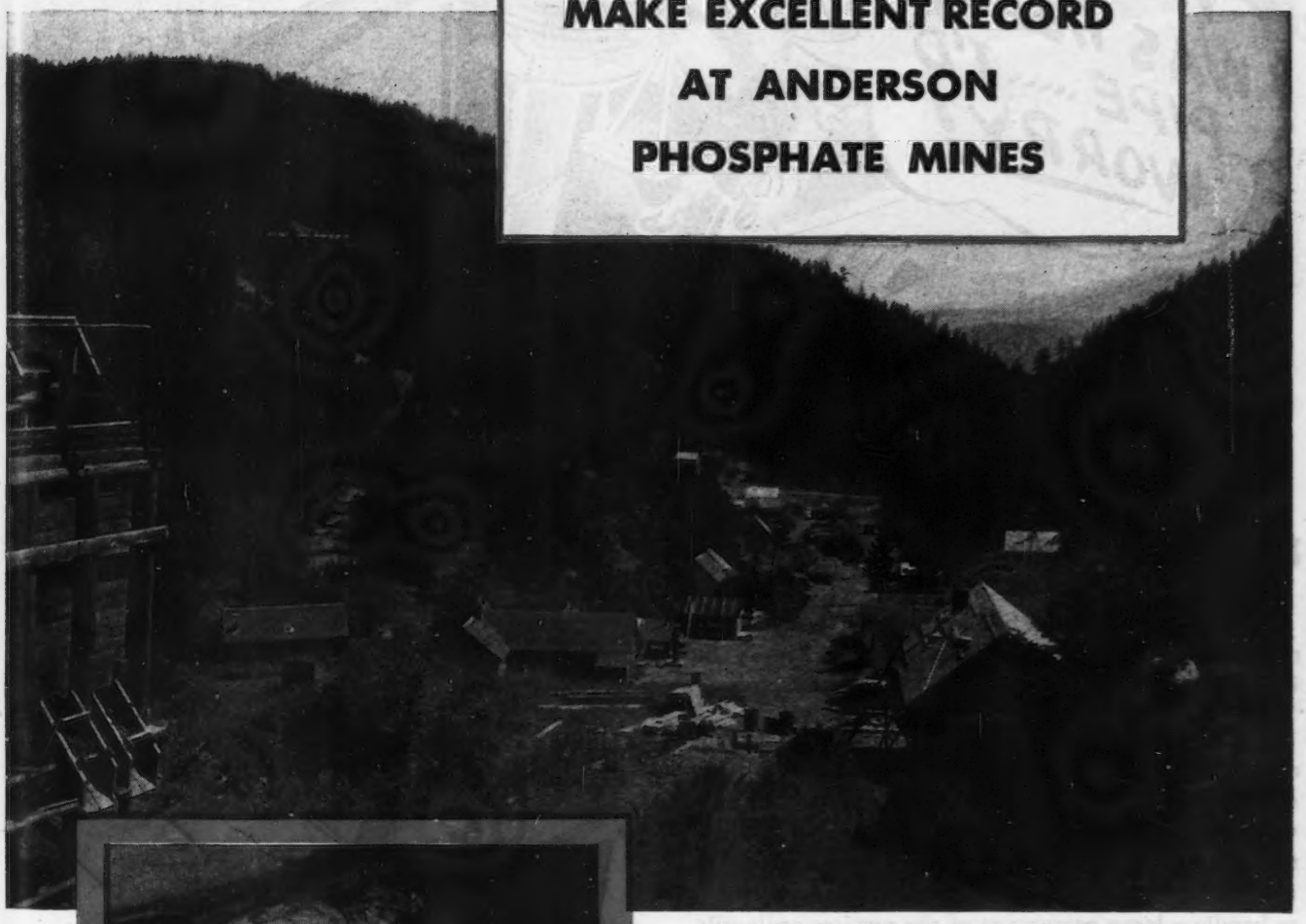
The Walco wrench is made in lengths of 6"—8"—10"—14"—18"—24"—36"—and 48". The 6" and 8" sizes have integral lower jaw.

BOSTON WORKS
KEWANEE WORKS

WALWORTH
valves AND fittings

WALWORTH ★ VALVES AND FITTINGS ★ ESTABLISHED 1842

TIMKEN ROCK BITS MAKE EXCELLENT RECORD AT ANDERSON PHOSPHATE MINES



General view of the Anderson Phosphate Mines property, Garrison, Montana.

Stope drilling at the 5,600 foot level, Anderson Phosphate Mines.

If you don't believe phosphate mining is a tough job, ask any miner at Anderson Phosphate Mines, Garrison, Montana.

Timken H Series Side Hole Bits have been used at this property for several years to the great satisfaction of everyone concerned.

The operations at these mines are scattered, and access is difficult to a large number of the working faces underground, adding appreciably to transportation problems. By consistently reducing both transportation and nipping costs as well as cutting drilling time, Timken Bits have made gratifying savings.

While Timken Bits have been making drilling service records, employees of Anderson Phosphate Mines have been making War Bond buying records. For example, Sam Basovich, the miner shown running the stoper, has purchased $7,400.00 worth of bonds since Pearl Harbor. That's a patriotic pattern for every industry. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

ROCK BITS

And the man who foots the bill would worry too—

Taylor Spiral Pipe isn't light enough to "float through the air" But it *is* light enough to make a real cut in the initial cost, handling cost and erection cost of piping.

If Taylor Spiral Pipe had only lightness to recommend it—if it weren't also strong and rugged to a remarkable degree—the economy of this light wall pipe would be narrowed down to a limited field of application. But the fact is that the spiral construction makes it the strongest type of pipe of its weight . . . enables it to handle a large percentage of the services ordinarily performed by far heavier and more costly Standard Thickness pipe.

Note the suggested uses for Taylor Spiral Pipe listed below. These are the everyday moderate and low pressure services for which Standard Thickness pipe is ordinarily used. Why? . . . Simply because too many plants still follow the old tradition of using everyday pipe for everyday uses! By uprooting the heavy pipe habit — using Taylor Spiral Pipe for uses like those listed—you can cut the installed cost of piping way down . . . in many cases to half that of Standard Thickness pipe.

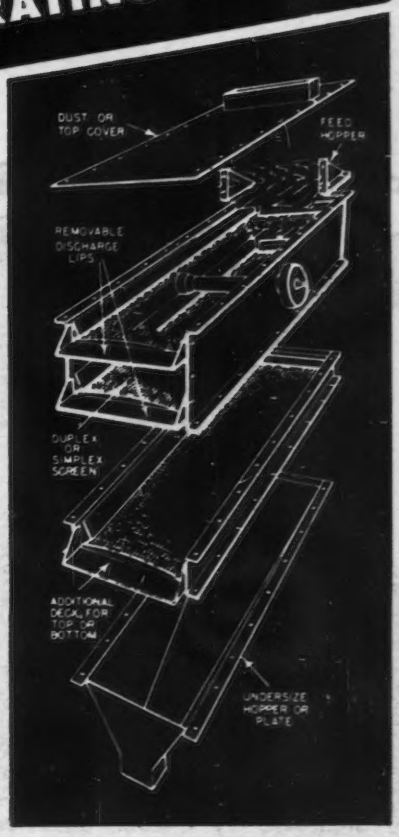
Switching to Taylor Spiral is made easy by the complete range of sizes and wide variety of fittings. Thicknesses range from 18 to 6 gauge; sizes from 4 to 42 inches; joint lengths up to 40 feet. All types of end joints and couplings, all kinds of fittings and specials or fabricated assemblies, are produced by Taylor Forge, assuring a complete service with undivided responsibility.

TAYLOR FORGE & PIPE WORKS
General Offices & Works: Chicago, P. O. Box 485
New York Office: 50 Church St.
Philadelphia Office: Broad Street Station Bldg.

CHANGE TO TAYLOR SPIRAL PIPE FOR:

- High and Low Pressure Water Lines
- Low Pressure Steam and Air Lines
- Steam and Diesel Exhaust Lines
- Vacuum and Suction Lines
- Blower Piping
- Sand and Gravel Lines
- Industrial Gas Lines
- Oil and Gas Gathering Lines
- Swing Pipe
- Spray Pond Piping
- Hydraulic Mining
- Dredge Lines

DENVER-DILLON VIBRATING SCREEN



With Only Two Bearings . . . Cuts Your Power Cost in Half

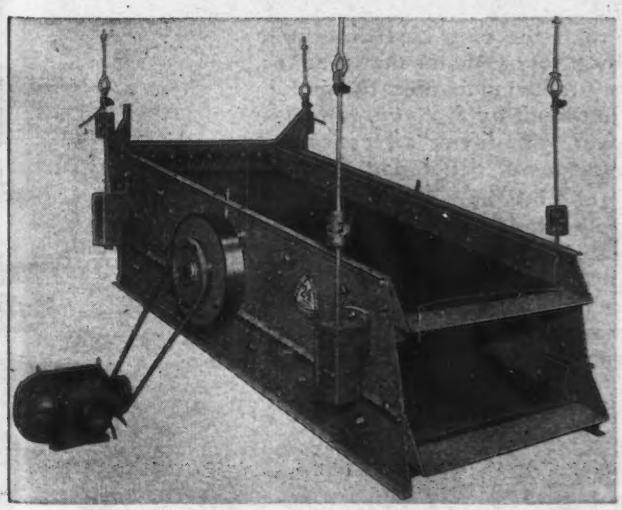
The patented design of Denver-Dillon Vibrating Screens requires just two bearings instead of the four used in ordinary mechanical screens, resulting in simplicity of construction . . . which cuts power cost in half for any screening job; reduces operating and maintenance costs.

With this simplified, lighter weight construction all power is put to useful work . . . thus, the screen can operate at higher speeds when desired, giving greater screening capacity at lower power cost.

The "sting" of the positive, high speed vibration eliminates blinding of screen openings.

Positive "Floating Circle" Motion Increases Screening Efficiency

The "Floating Circle" principle gives the entire screen body a positive and uniform full circle motion . . . thus, the vibration is uniformly distributed over the entire screen area, resulting in greater capacity and more efficient screening. There are no "dead" spots on the screen to reduce capacity.



Suspension Type Denver-Dillon Vibrating Screen. Double deck converted from a single deck unit.

Flange Construction Gives Maximum Flexibility

Flange method of construction permits economical means of attaching additional screen deck on top or bottom of standard simplex or duplex screens. Dust covers and hoppers may also be added. This flexibility permits screen conversions, frequently necessary due to changes in operations, without expense of purchasing entire new screen.

Get Your Free Copy of New Bulletin

The Denver-Dillon Vibrating Screen is made in sizes from 1′ x 2′ to 6′ x 14′ with from one to four decks, in suspended or floor mounted types. For complete specifications on these screens just fill in and mail the coupon below TODAY.

*Patented and Patents Pending

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

STANDARD RELIABLE 24 HOUR SERVICE EFFICIENT

DENVER EQUIPMENT COMPANY, 1400 17th St., Denver 17, Colorado

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The Blast Hole Drill with SUL

The HS-15, Sullivan's new high-speed drill, is specifically designed for underground blast hole drilling. This new rotary drill embodies all the desirable features indicated by a comprehensive, 4-year study of rotary blast hole drilling in North America and Africa. In its design is incorporated engineering experience available only to Sullivan, the oldest manufacturer of core drills.

Only the Sullivan HS-15 has the direct "INLINE-DRIVE" which provides a rigid vibrationless drive that substantially reduces the number of working parts, making it the lightest, most compact and most easily handled drill of its kind, a combination that assures lowest operating costs.

By stepless throttle control, rod speeds ranging from 0 to 3300 RPM are available. A unique, built-in arrangement makes it possible to switch instantly to a lower speed range (0 to 1800 RPM) for long hole blast drilling or for exploratory core drilling.

The HS-15 is the only blast hole drill powered by a rotary motor that requires no efficiency-reducing muffler. The motor, designed and built by Sullivan, provides ample power with lower air consumption per horsepower developed.

Plug or solid bits may be used on the HS-15 for blast hole drilling or, core bits may be substituted when core drilling. For holes in excess of 100 feet, the Sullivan pneumatic rod puller is available and can be mounted on the same bar or column with the drill.

Bulletin describing the new Sullivan HS-15 in detail will be mailed on request. Sullivan Machinery Company, Michigan City, Indiana. IN CANADA: Canadian Sullivan Machinery Co., Ltd., Dundas, Ont.

SULLIVAN

HS-15 HIGH SPEED CORE DRILL

OFFICES—Birmingham • Boston • Butte • Chicago • Claremont • Dallas • Denver • Duluth • El Paso • Huntington • Knoxville • Los Angeles • Middlesboro • New York • Philadelphia • Pittsburgh • Portland • Salt Lake City • San Francisco • Seattle • St. Louis • Washington, D. C. **PRODUCTS**—Core Drills • Blast Hole Drills • Core Drill Contracting • Hoists • Scraper Haulers • Loaders • Rock Drills • Air Compressors.

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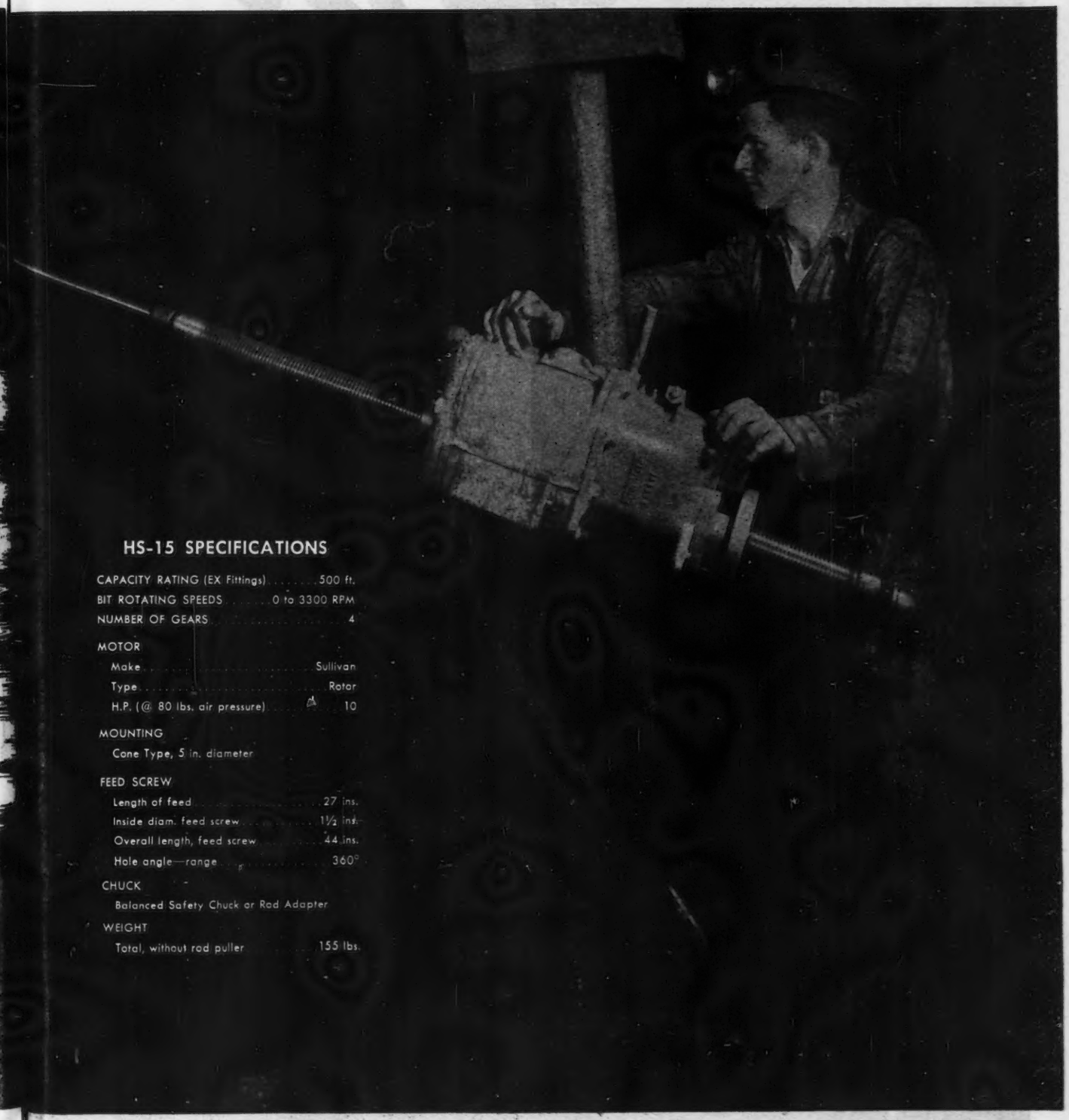
Every Desirable Feature!

LIVAN HS-15



HS-15 SPECIFICATIONS

CAPACITY RATING (EX Fittings)	500 ft.
BIT ROTATING SPEEDS	0 to 3300 RPM
NUMBER OF GEARS	4
MOTOR	
Make	Sullivan
Type	Rotor
H.P. (@ 80 lbs. air pressure)	10
MOUNTING	
Cone Type, 5 in. diameter	
FEED SCREW	
Length of feed	27 ins.
Inside diam. feed screw	1½ ins.
Overall length, feed screw	44 ins.
Hole angle—range	360°
CHUCK	
Balanced Safety Chuck or Rod Adapter	
WEIGHT	
Total, without rod puller	155 lbs.

Rock or Dirt

DUMPED INSTANTANEOUSLY

Time saved on the fill is time saved for every trip . . . more trips per hour . . . more production per shift. The Koehring Dumptor dumps any type material *instantaneously*. Seconds saved over mechanical dumping method speeds up every hauling and dumping job. Rock or dirt is dumped equally fast and the load is dumped clean every time . . . ready for a full load every trip.

KOEHRING COMPANY
Milwaukee 10, Wisconsin

DEPEND ON YOUR KOEHRING DISTRIBUTOR to help you keep your equipment operating. Care for your Koehring equipment NOW, so it will serve you tomorrow. Koehring distributors have genuine Koehring parts. Koehring parts warehouses are at your service.

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KOEHRING HEAVY DUTY

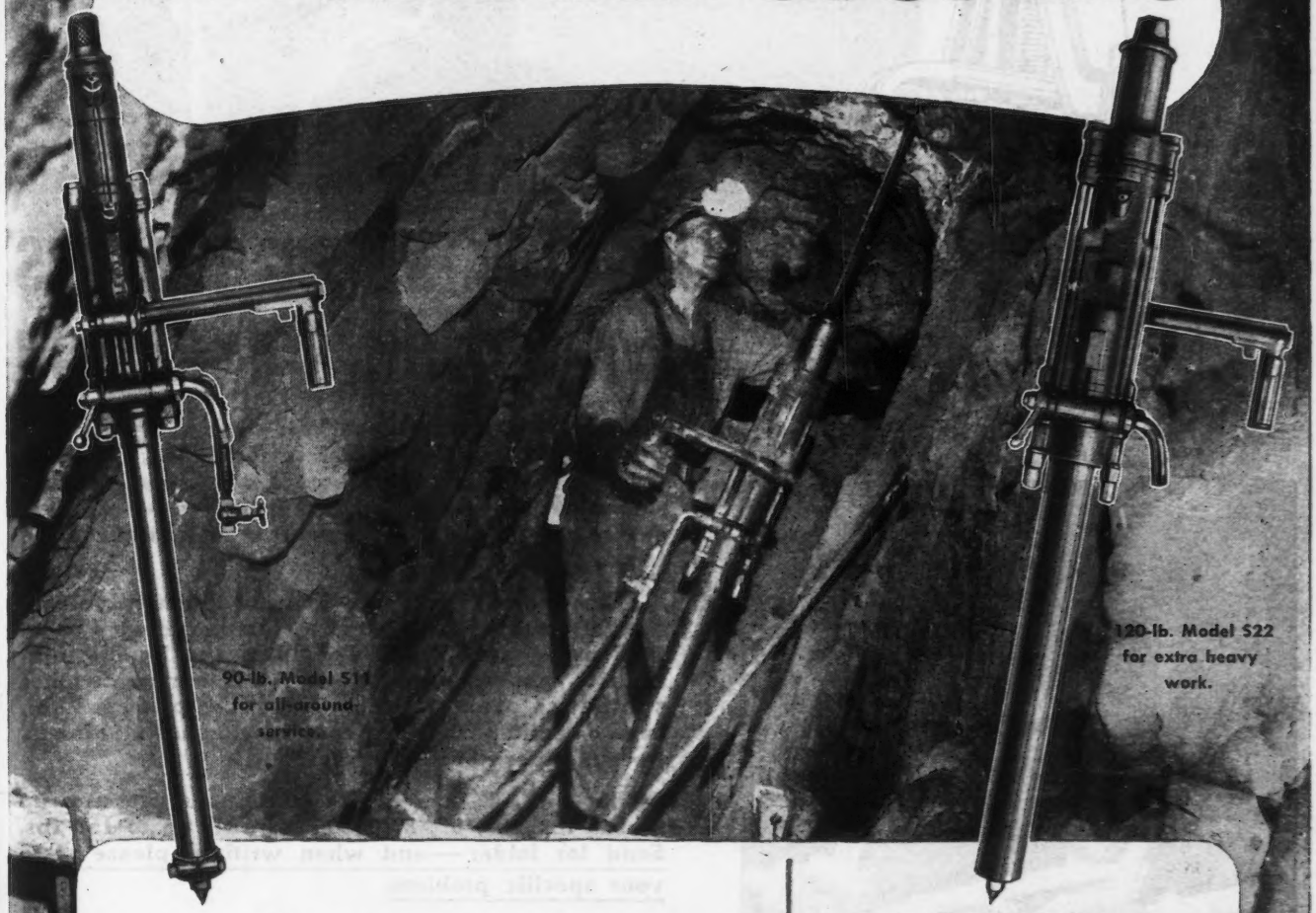
HEAVY-DUTY CONSTRUCTION EQUIPMENT

Real Footage

round after round, month after month

WITH

CLEVELAND STOPERS



90-lb. Model S11 for all-around service.

120-lb. Model S22 for extra heavy work.

● A complete line—sizes for every class of work—both automatic and hand-rotating models. Extra powerful, well balanced, easy to handle—yet low in air consumption. Trip rotation and air feed relief—patented Cleveland features—insure extra convenience, greater safety. Large oil pockets for smooth, fast cutting and longer life. End seating valves—standard on Cleveland Stopers—increase in efficiency with use. All models available with any standard chuck size.

Write for Bulletins 127 and 129

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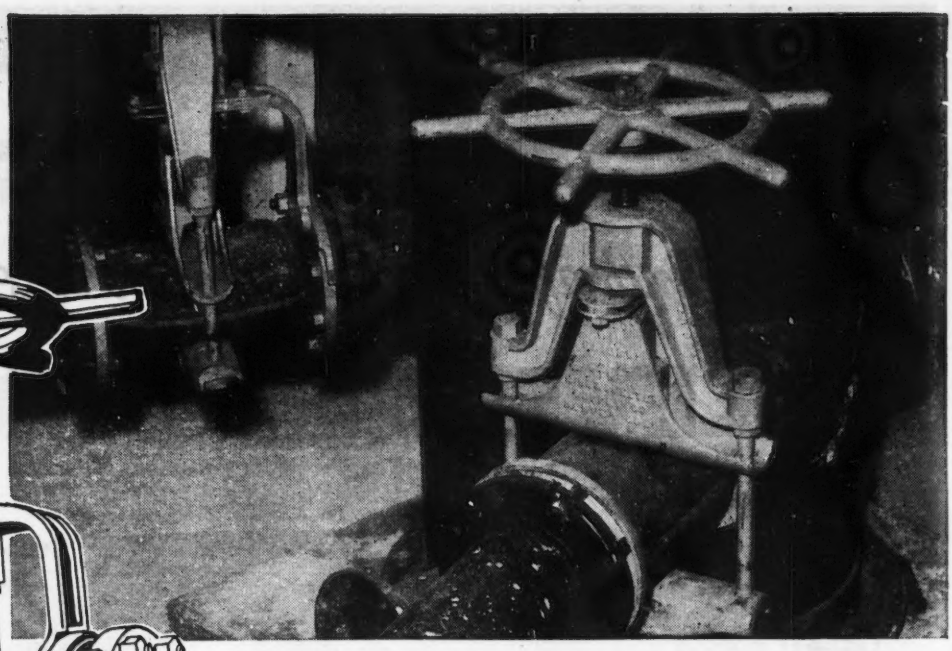
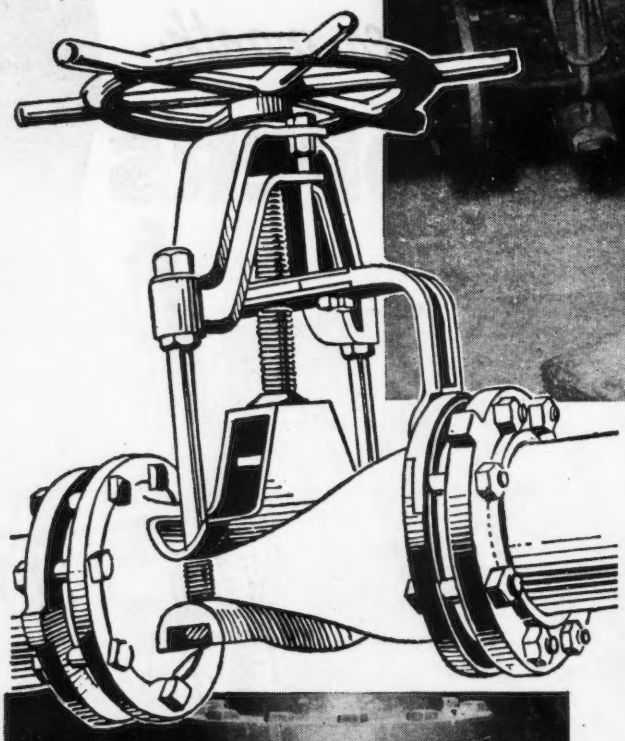
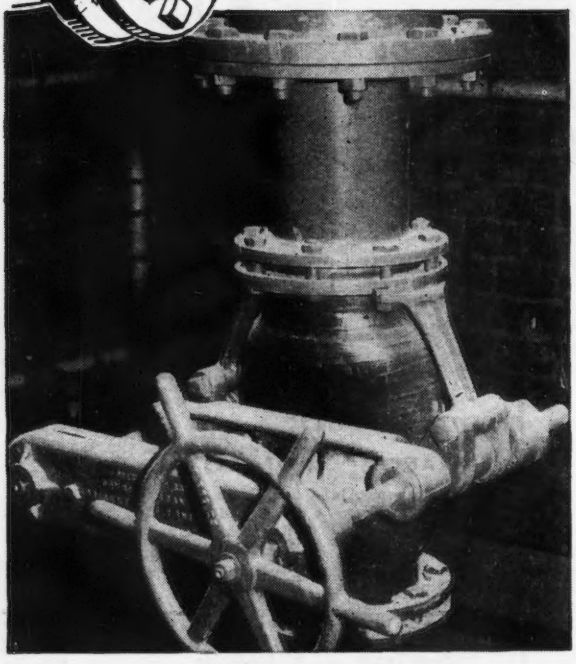
MASSCO-GRIGSBY PINCH VALVE







THIS VALVE WITHSTANDS CORROSION & ABRASION

The Massco-Grigsby Pinch Valve has many applications in ore milling plants, cement mills, dredging and other industrial operations . . . transporting abrasive and/or corrosive pulps and liquids — wherever severe wear makes replacements of metal type valves too costly.

Essentially the Massco-Grigsby Pinch valve consists of a rubber sleeve and a clamping device operated by a hand wheel. For pulps and liquids injurious to rubber, special sleeves of Neoprene or other synthetics are supplied. The valve pinches tight, even on solid particles; it contains no packing glands; freezing does not destroy it.

SIZES — 1", 2" and 3" for continuous pressure up to 100 lbs.; 4", 6", 8", 10" and 12", up to 150 lbs. Send for folder — and when writing, please state your specific problem.

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